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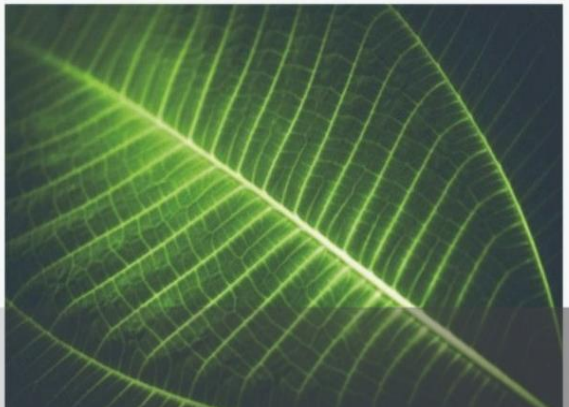

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Prevalence of Common Parasites in Sheep of Kashmir Valley

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INTRODUCTION

Livestock is an important and an integral component of agriculture in India and contributes immensely to the rural economy of the country. The contribution of agriculture and livestock to the total GDP has increased from 5.04% in 2007-08 to 18.52% in 2013-14. Rearing of sheep and goat in advanced countries like USA, Australia and New Zealand is commercialized and is being run on large scale by private entrepreneurs. In India, however the rearing of Sheep and goats is a traditional vocation of most of the nomadic tribes in the states of J & K, H.P., U.P., Rajasthan, Gujarat, Maharashtra, Karnataka, A.P. etc. Sheep and goat rearing provides livelihood to the large proportion of small and marginal farmers and landless labourers. Livestock sector in J&K is emerging as important component for growth and economic development. Estimated livestock Population of the state, as per the latest available integrated sample survey (2011-12), is 160.407 lac. comprising of 39.204 lac sheep, and, 18.136 lac goats, .The estimated meat production registered a growth from 308.986 lac Kgs to 322.781 lac Kgs over the previous year resulting into 4.47% growth. The annual losses in livestock sector is estimated to be Rs 43,200 crore of which 32% is valued at Rs 13,830 crore is on account of disease. Parasitic diseases of sheep is grave cause of economic loss to sheep – raising industry all over the world, not only impose direct impact but renders the animals more liable to other diseases ,thereby lowering the vitality ,likewise in valley, the parasitic infestation is the major constraint in survival and productivity of sheep/goat – raising industry and have got unique importance as they cause high morbidity and huge economic losses in the form of low wool, meat and milk production, retarded growth, morbidity, mortalities and reduced FCR, inefficiency of production and by way of cost incurred in treatment and control of diseases.

The prevalence of common parasites in Kashmir region that is tremendously affecting the progress of sheep industry have been studied at DIL Nowhera Srinagar by an investigation carried out from 2013-2014 to 2014-2015 through routine parasitological examinations of 10328 feacal samples randomly collected/received from organized (Farms) and unorganized sectors of valley, besides samples were collected during outbreaks in private flocks. The aim to determine the prevalence of helminthes in valley is to minimize the economic loss of sheep rearing community by effective strategic control of parasitic infestation in sheep husbandry.

Brief description of common parasites: The brief description regarding the common parasites revealed during study and their prevalence in sheep is depicted as under.

Haemonchus controtus: Gastointestinal nematodes rules highest on global index with Haemonchus controtus on top. This parasite is considered to be the most pathogenic nematode of livestock in recent years as it is a blood sucking parasite that pierces the lining of abomasums causing blood plasma and protein loss to the sheep, bottle jaw-accumulation of fluid under the jaw. The effective control of this parasitism has been hindered due to lack of epidemiological data, limited integration of geographical and agroclimatic conditions, under managemental practices and emergence of antihelminthic resistant strains of parasites in Kashmir valley. The observed prevalence of **Haemonchus controtus** during 2013-2014 and 2014-2015 was 15.13% and 11.04 %, respectively.

Moniezia Spp: The Segments of these worms most commonly seen in the sheep faeces. When lambs are heavily infested the mechanical intestinal obstruction caused by the presence of worms and the irritation set up interferes seriously with the health and growth of animals of the animals. It is seen that the lamb growth rate may be affected when large number of tapeworms are present. The prevalence for **Moniezia Spp was** 13.69% and 0.40% during 2013-14 and 2014-15, respectively.

Coccidia- Eimeria: Coccidian is a single cell protozoa that damages the lining of the small intestine. Coccidiosis is very common in sheep especially young growing lambs. It causes unthriftiness, tucked-up appearance diarrhea, dehydration, fever, weight loss, loss of appetite, anaemia and death. The lambs become very weak and may eventually die from exhaustion. Mortality may commence with few lambs being found dead and then gradually increase to 20to 30% of flock or more. 7.07% and 10.12% prevalence for Eimeria was observed during 2013-14 and 2014-15, respectively.

Strongyloides: Infestation is usually by penetration of larvae via skin. Damage to skin between and around feet produce by skin penetrating larvae, resembles the early stages of foot rot and aid the penetration of casual agent of foot rot. Migration of larvae through lungs may cause pulmonary hemorrhage manifested clinically by cough. Intestinal infection cause catarrhal enteritis resulting diarrhea in young animals. The prevalence for Strongyloides was 10.68% and 14.61 % during 2013-14 and 2014-15, respectively.

Fasciola Fasciolosis, the disease, that had caused much havoc in past, now has been drastically reduced by the effective strategic dosing regimen by the field authorities with advanced technical inputs from time to time by the department. However, deaths due to acute fasciolosis have been reported from some areas of valley. The prevalence for Strongyloides was 0.02 % and 0.01 % during 2013-14 and 2014-15, respectively.

Trichostrongylus: Infestation is mainly a problem in lambs, in which it causes villous atrophy and loss of plasma into intestine due to increased vascular permeability leads to black scours, anaemia stunting growth in older sheep, infestation remains at low levels and is rarely serious. The prevalence for Strongyloides was 0.14 % and 0.25 % during 2013-14 and 2014-15, respectively.

Nematodrius: Infestation causes serious parasitic gastroenteritis resulted of inappetance, acute diarrhoea, weight loss in a group of healthy spring lambs. The infestation in young lambs is sudden, hyper acute and rapidly fatal if untreated. Prevalence of 5.23 % and 0.33 % for Trichuris during 2013-14 and 2014-15, respectively observed.

Trichuris: The species usually considered to be innocuous but if present in large number may cause sufficient irritation which result in bloody diarrhea, anaemia, weekness, and abdominal pain. The prevalence of common parasites in sheep from 2013-14 and 2014-15 is presented in Tables and 2, respectively. Prevalence of 0.07% and 0.027 % for Trichuris during 2013-14 and 2014-15, respectively observed.

Table 1: Prevalence of common parasites in sheep 2013-2014

Season	Month	Samples examined	Samples +ive		Number of Animals infested						
				Haemonchus	Strongyleiod	Eimeria	Moneizia	Nematodirus	Trichostrongylus	Trichuris	Fasciola
Spring	March	258	179	20	52	--	08	--	--	--	--
	April	350	226	---	42	50	174	--	--	--	01
	May	484	279	201	23	54	-----	--	--	14	--
Summer	June	375	160	-----	19	34	72	05	--	--	--
	July	243	91	42	---	20	12	09	--	--	---
	August	237	84	25	12	29	---	--	--	--	--
Autumn	September	363	275	103	10	19	----	75	--	07	--
	October	207	118	64	25	----	29	05	03	--	--
	November	371	292	----	63	40	95	38	26	--	--
Winter	December	228	154	----	26	15	70	24	--	--	--
	January	271	170	103	45	---	----	17	01	05	--
	February	301	145	----	77	----	45	20	25	--	--
Total NO.		3688	2173	558	394	261	505	193	55	26	01
% infestation			58.92%	15.13%	10.68%	7.07%	13.69%	5.23%	0.14%	0.07%	0.02%

Table 2: Prevalence of common helminthes of sheep 2014-2015

Season	Month	NO.of samples tested	No.of animal+ive		Number of Animals infested						
				Haemonchus	Strongyle	Eimeria	Moneizia	Nematodirus	Trichostrongylus	Trichuris	Fasciola
Spring	March	299	98	01	75	03	13	09	--	--	--
	April	260	71	06	42	08	--	07	17	--	--
	May	72	49	24	17	21	13	03	--	--	--
Summer	June	188	128	24	55	77	09	29	05	--	--
	July	138	58	08	02	28	19	03	--	--	--
	August	45	18	10	14	01	02	--	--	--	--
Autumn	September	62	20	10	21	--	--	01	--	--	--
	October	70	28	02	13	--	--	--	--	--	--
	November	253	109	21	17	--	12	06	14	01	03
Winter	December	322	119	70	11	32	06	04	06	04	--
	January	106	28	19	03	02	--	--	04	--	--
	February	32	29	11	--	14	--	--	02	--	--
Total		1847	755	204	270	187	74	62	48	05	03
%tage			40.87%	11.04%	14.61%	10.12%	0.40%	0.33%	0.25%	0.027%	0.01%

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Insect Traps and their Role in the Management of Insect-Pests

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INTRODUCTION

Trapping is the most common method used for population estimation, surveillance, monitoring and mass trapping over large areas in Integrated Pest Management programmes. The traps are generally of two types *viz.*, *interception traps* (catch insects randomly), and *attraction traps* which attract the insects and render the crops safe. The interception traps provide the indices of abundance more easily than the other type, as there is no variation due to attraction. Flight traps, aquatic traps, pitfall traps, vacuum traps, malaise traps and windowpane traps are included under interception traps. The traps that attract the insects by some natural stimulus or substitute comprise the shelter traps, light traps, trap host plants, bait traps, sound traps, pheromone traps and allelochemical traps. Examples of conjugation of interception and attraction are sticky traps and water traps. The number of insects caught in a trap depends upon their density, activity, movement range and individual expertise in the selection and placement of the traps. Insects are attracted to different cues *viz*., visual, chemical or olfactory to communicate with each other or find suitable hosts. This flaw of insects has been explored by using traps. Traps are particularly useful for detecting the initial appearance of a pest and decision making. Seasonal activity of various pests can also be monitored using specific traps. Different types of traps have been used to sample insects. Traps are installed at specific locations and the insects trapped in them are counted at regular intervals. Sometimes, some lures/attractants are placed in the traps so that specific insects get attracted and trapped. However, some limitations with such traps are that it is difficult to define the area of influence and sometimes insect responses may change with time. A variety of devices are used to collect/prevent/kill insects for subsequent use. Some, like hand nets, bag and hopper dozers, suction traps and light traps can be used for collecting insects for subsequently killing them described below briefly.

Those, which can prevent their entry, include attractive lamps for attracting insects away from the area to be prevented, air curtains and slippery bands. Those, which kill them, include electrocuting grids and flame throwers. The different devices/traps for monitoring the insect-pests are mentioned underneath.

i) Electrocuting-grids

Electric units having a UV lamp have been used to control house flies and blowflies. Such units meant for fixing on the wall, are commercially available. The electrocuting device kills insects instantly and retains the cadavers in a removable tray. This arrangement prevents falling of dead ones into food or where their presence is undesirable. The UV lamp is positioned within an electrified grid, and any insect flying through it. Fly and moth problems within dairy barns can be greatly reduced by using electrocutor grid traps with black light fluorescent lamps as insect attractants. It is especially recommended for use in food processing establishments, hospitals and factories.

ii) Light traps

Diverse light traps have been used for attracting nocturnal and stored grain insects. It is the most widely used visual trap employed for sampling agricultural pests, particularly moths, hoppers and beetles, etc. A light trap essentially consists of a light source above a funnel and a container below to collect the catch. It is covered with a protective roof. The light source is generally an oil lamp or electric bulb or fluorescent tube. Insecticides with quick knockdown or fumigant action, such as dichlorvos, are sometimes added to the container.

Many moths and night flying beetles are attracted to short wavelengths of the light spectrum or the black light. So, black light lamps emitting ultraviolet light are widely used in trap design. Shorter wavelengths of the ultraviolet to blue are more attractive to insects in comparison with longer wavelengths of yellow, red and infrared. Though light traps are occasionally used to control insects, they are usually less efficient than other methods of control. Therefore, they are used primarily for detection, surveys and monitoring insect-pest densities to aid decision making. There are many types of light traps. However, besides several species of moths, beetles, flies, and other insects, most of which are not pests, are also attracted to artificial light. So, identification of pests and beneficial insects is of prime importance before any control operation is executed. The simplest light trap consists of a bulb on a cable hanging out in the field for attracting the pests during the night hours. Another is an oil lamp placed on a stone in the centre of an open pan containing water with a film of oil on it. The lamp may instead be hung from a post over the middle of the pan. The insects attracted to the light fall into the pan and get killed. In another light trap, an electric bulb is fixed at the top of a funnel-shaped cone. The lower narrow end of the cone terminates in a bottle containing a fumigant, e.g., calcium cyanide. The insects attracted to light are liable to fall in a bottle through the cone. A device for trapping the stored grain insects using an ultraviolet light source (4 W germicidal lamp) has been commercialized by TNAU, Tamil Nadu. Light traps have been used in the past for mass trapping of insects like the red hairy caterpillar, *Amsacta moorei* L. (Patel et al., 1981; & Saini & Verma, 1991). NIPHM, Hyderabad has developed an affordable natural enemy friendly light trap to enable insect trapping in field conditions thereby reduce the application of chemical pesticides. The trap is provided with a plastic funnel catcher through which the insects fall into a perforated plastic holding jar. Perforations are so made in the holding jar to enable the segregation and escape of the smaller size predators and parasitoids back into the field. A CFL lamp serves to provide the blue colour light to attract the insects in the field. The major problem with light traps is that, sometimes, a large number of non-target species, which may include useful ones, also get trapped which not only make sorting cumbersome but also disturbs the ecological balance.

iii) Suction traps

The suction trap is a machine for controlling the cotton boll weevil and it works on the same principle as a vacuum cleaner. The debris including the infested squares is sucked by the machine from the ground and is dropped back to the ground after pulverizing it. It is designed to pick up approximately 95.0 per cent of the fallen squares. A suction trap

consists of a wire-gauze funnel leading to a collecting jar and a motor-driven fan is situated below the funnel to create the suction. Such traps are also utilized for sampling alate aphids and leafhoppers.

iv) Fish-meal trap

For monitoring of shoot flies the fish-meal trap is more efficient in catching the flies. It consists of three jars of different size and one plastic funnel. The bigger coloured jar has entry holes for flies and also the fishmeal dispenser at the bottom. The lid of this jar has four big holes through which shoot flies enter the funnel and from there they enter the transparent collection jar. Some pebbles are placed at the bottom of the jar to make the trap more stable when placed on the soil surface. The flies attracted towards fermenting fishmeal, enter the coloured jar through entry holes. From the dark jar, the flies enter the transparent upper jar through the funnel and get trapped.

Bait traps rely on insect olfaction, or sense of smell, for attraction. A common attractant is food e.g., a mixture of yeast and molasses in a cone trap to sample corn maggot, *Delia platura* (Meigen) adults. The utility of such traps is often short-lived due to infection of the bait by micro-organisms. Therefore, the bait needs to be changed frequently to keep the trap active. For monitoring sorghum shoot fly, *Atherigona soccata* (Rondani), the fish-meal trap is quite effective (Singh & Verma, 1988).

v) Sticky traps

The efficacy of sticky traps is dependent on the response of insects to trap colour and height in relation to crop phenology. Yellow and blue sticky traps are generally used to attract and trap the whiteflies and thrips, respectively. Yellow sticky traps consist of yellow plastic sheets, plates or Petri dishes coated with some sticky substance, either grease or another diluted adhesive kept in position by poles or fixed to the ground by small stakes. Sharaf (1982) stated that yellow colour radiation induces vegetative behaviour of insect that may be a part of the host selection mechanism. These traps are installed on a wooden stake or a bamboo stick at various heights above a plant canopy. The insects get stuck in the adhesive applied to the trap's surfaces. Sticky traps are useful only against actively flying insects and provide useful information on the height of flight as well as on direction. Insects like aphids, hoppers, thrips, flies, hymenopterans and beetles get trapped in such traps.

vi) TNAU insect probe trap

The use of trap is relatively a new method of detecting trapping insects in stored grains. The basic components of a TNAU probe trap consist of three important parts: A main tube, an insect trapping tube and a detachable cone at the bottom. Equispaced perforations of 2 mm diameter are made in the main tube. They are also good mass trapping devices when used at 2-3 numbers / 25 kg bin. The insect trap must be kept in the grain bins vertically with the white plastic cone downside. The top red cap must be with the level of grain. Insects will move towards the air in the main tube and enter through the hole. Once the insect enters the hole, it descends into the detachable white cone at the bottom (Singal, 2006). These should be placed at the top 6 inches of the grain, where the insect activity is seen during the early period of storage. They can remove > 80% of the insects within 10-20 days.

vii) Pitfall trap

Pitfall traps are one of the important monitoring and mass trapping tool for insects active on grain surface and in other layers of grain. The standard model of pitfall trap has 2 parts *viz*., a perforated lid (2 or 3 mm) and a cone shaped bottom portion. TNAU model has a perforated lid, cone-shaped bottom which tapers into a funnel-shaped trapping tube mainly used for early detection of infestation as well as for further avoiding the damage to stored pulses by pulse beetle, *Callosobruchus*

spp., a stored grain pest. Pitfall trap can be placed in a metal bin, small tin container, utensil and plastic bucket used for storage of any kind of pulses. Beetle once trapped on the greasy or sticky slope of trap cannot escape and succumb to death after some time. These traps are suitable for early detection of infestation as well as for further avoiding the damage to stored pulses by pulse beetle, Commercial model is carved out of plastic, simple and economical (Rs. 25 per trap).

viii) Pheromone traps

A pheromone trap is a type of insect trap that uses pheromones to lure insects. Sex and aggregating pheromones are mostly used to attract and kill the insect-pests. Pheromones are packaged or encapsulated in slow-release dispensers (rubber septa), hollow fibres or rope wicks that are used as a lure in traps of various design. At low densities, these pheromones traps are valuable monitoring tool, providing information on the density and distribution of pest population. At high densities, they can be used for mass trapping sexually active adults in efforts to reduce population density. For commercial application, these are used as pheromone-baited traps for monitoring insect population. Female sex pheromones are formulated in slow-release dispensers and deployed in monitoring traps to attract male members of a species, e.g., Helilure (*Helicoverpa armigera* L.). Pheromone traps can be used to detect both the presence as well as density of pest species. Secondly, use of pheromones combined with insecticides in a lure and kill approach or mass trapping; mass trapping is possible in case of adult insects with a highly developed ability to respond to attractants. The pheromone is deployed in dispensers and has no direct contact with the crop. A modification of the mass trapping technique is the lure and kill method, where instead of being trapped, the responding insects come in contact with a conventional insecticide.

ix) Water trap

It consists of a shallow open pan or tray mounted on a wooden post which is filled with water having some detergent or soap or oil film to aid in wetting or drowning the insects. An omni-directional baffle is usually set in the pan for the interception of insects. The baffle and the interior of pan are sometimes painted (e.g., yellow for aphid) to add physical attraction to the trap. Water traps are useful, in sampling rice pests e.g., brown plant hopper. However, these require protection from weather and catch is to be removed and traps refilled regularly.

x) Malaise trap

A malaise trap essentially consists of a tent made of netting, with one open side, into which insects either fly or crawl. It was invented by Rene Malaise in 1934. Since most insects automatically crawl up the netting once inside, they can be trapped in vials of preservative placed in the upper corners or the peak of the tent. Since these traps depend upon the insect to enter them accidentally, they work well for highly active species such as adults of Diptera and Hymenoptera. The malaise trap is basically a tent made of cotton or nylon mesh with one side open the intercepts flying insects. The roof of the tent slopes upwards to a peak where a container with some preservative is located. Insects tend to move upward and into the container while flying and get collected in the container.

xi) Windowpane trap

Flying Coleoptera can be sampled using windowpane traps, which consist simply of a vertical pane of glass or Plexiglas with a preservative beneath it. Any insect that hits the glass and reacts by falling is caught. These traps are particularly useful for determining the direction of light and can also provide data as to when dispersal flights occur. This is a kind of interception trap consisting of a large sheet of glass that sits in a collecting trough. Insects flying into the glass are knocked down into the trough containing soapy water.

Insect-pests regularly develop resistance against newer chemical insecticides, which is not our desirable achievement and it can be reduced by traps invention and adoption. Trap application performs much better in sustainable agriculture practices, as it doesn't give any residual effects on the field. The part of ideal IPM is not to harm beneficial insects. Hence insect traps fit in the IPM practices almost ideally Extension Department should give awareness to farmers about the trapping system for prosperity and chemical-free healthy environment.

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Health Benefits of Brinjal (Eggplant)

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INTRODUCTION

Eggplant (*Solanum melongena* Linn.) is warm season plant and commonly known as brinjal or aubergine. Eggplant belongs to the solanaceae family and frequently cultivated in the tropical and sub-tropical region of the world. India is considered as origin place of the eggplant and was introduced to Europe by the Arabs and transported to Africa by the Persians. India is the second largest producer of the eggplant after china and followed by Egypt and Turkey. In India, it is cultivated as important vegetable crops.

Eggplant is branching bushy plants with thick and woody stem. Leaves of eggplants are green to grayish in colour, large size and covered with spiny fuzz. There are many sizes and shapes of fruit, with skin colors ranging from blackish purple to florescent purplish green to gold or white. In addition, some varieties produce lovely bicolor or striped skin. The fruit has a dense, uniform and firm, white, sweet flesh. It is generally grown twice or thrice in the year and fruit is available throughout the year. The cultivation of eggplant is like other solanaceous vegetable crops.

Thick pericarp, least amount of the fibers and freshness during the storage throughout the period without developing brown colour are considered as good characteristics of the brinjal fruit. The whole fruit of the brinjal is edible but form of the bulk of fruit and contains most of the nutritive ingredients while fibers are not desirable. Eggplant has great importance in the solanaceous vegetable crops because of the presence of high nutritive and medicinal values.

Nutritional Contents of Eggplant

The fruit of eggplant has very high nutritive and medicinal value. Eggplants are nutrient-dense food because of the presence of sufficient amount of the minerals, vitamins and fiber.

An eggplant fruit contains variety of nutrients viz. calories, carbohydrates, fiber, proteins, amino acids, manganese, folate, fat, potassium and vitamins. The present carbohydrates in the fruits are glucose, fructose, sucrose and rhamnose. The bitterness of brinjal fruit is due to the presence of solasodine, solanidine alkaloids and some other plant secondary metabolites. Brinjal seeds also contain the good amount of the oil percentage. The oil found in the brinjal seed is high in antioxidants. The dry seed of the brinjal contain 21.2 per cent oil. Some other phenolic compounds like anthocyanins, including nasunin, lutein, and zeaxanthin are found in the eggplant and acts as antioxidants.

In general, a 100 gm fruit of eggplant contains 92 gm water, 4.7 gm carbohydrates, 1.4 gm protein, 1.3 gm fiber and 0.3 gm fat. Eggplants are richest source of minerals. According to an estimate, a 100 gm fruit of eggplant having the 200.0 gm potassium, 52.0 mg chlorine, 0.8 mg iron, 2.4 mg manganese, 16.0 mg magnesium, 17.0 mg copper, 44.0 mg sulphur, 47.0 mg phosphorus and 30.0 mg sodium. Nicotinic acid and iodine are also found in the well developed fruit of eggplant. The developed fruit of eggplant contains nicotinic acid 0.9 mg/100gm and 0.7 mg iodine per 100 mg of the fruit weight.

The dry weight of the eggplant fruit contains 14 to 18 % of proteins. Almost essential amino acids are found in the brinjal fruit and increase the nutritive value. The essential acid composition of the per gm of fruit dry weight contain tryptophan 0.06 mg, metheonine 0.06 mg, lysine 0.10 mg, histidine 0.11 mg, arginine 0.21 mg, threonine 0.23 mg, phenylalanine 0.27 mg, isoleucine 0.32 mg, valine 0.37 mg and leucine 0.39 mg. Brinjal fruit is the richest source of vitamin C and Vitamin A. Its fruit and leaves contain vitamin C and α-tocopherol. According to an estimate, a 100 gm eggplant fruit contain 12.0 mg ascorbic acid, 0.11 mg riboflavin, 0.04 mg thiamine, vitamin C 12.0 to 24.4 mg and 124 I.U. of the vitamin A.

Health Benefits

Brinjal fruit has high nutritive value and medicinal property. In addition, its leaves and seeds have also been found to be useful in veneral disease like syphilis. The leave extract of the eggplant is used in the cure of several types of skin diseases, otitis, anorexia piles, inflammation, intestinal foot pain and intestine difficulties. Raw fruits help in improving appetite and enriching the blood. It has also been found cardio-tonic. Ripe fruits are used as laxative and leaf extract is an important constituent of liver medicine.

Eggplant is the richest source of anthocyanin and their derivatives. The anthocyanin present in the eggplant fruit has significant role against neuronal problems, cardiovascular disorders and diabetes. The fiber contents of the eggplant play crucial role in digestion removing harmful materials from the stomach. The other phytonutrient of the eggplant boost the memory function of the brain and maintain the brain health by protecting its cell membrane. They have also the ability to protect brain from the brain tumour.

Eggplants are also the richest source of mineral nutrients like Mn, Mg, K, Cu and Fe. These mineral nutrients are important for the healthy bones. Eggplant fruit is suggested to the pregnant women's and lactating mothers because of the presence of good quality of the iron (Fe) source. The iron present in the eggplant has the ability to pact with amenorrhea, antenatal anemia and pre-menstrual syndrome. Moreover, the fruit of the eggplant is useful in the various disorders like diabetes, bronchitis, dysentery, high blood pressure and asthma. In addition, the well matured fruit of the eggplant is very useful against stomach troubles, compress for swellings and splintered nipples.

Eggplant is the also found as good source of the antioxidant. Some of the general use and health benefits of and eggplants and their bioactive compounds are as follows:-

- **Chlorogenic Acid:** In human body, chlorogenic acid acts as anti-obesity, anti –

carcinogenic, and anti-diabetic. Chlorogenic acid also shows anticarcinogenic functions by making apoptosis in many human cancer cells. They also have the properties of Antioxidant, anti-inflammatory, cardio protective.

- **Delphinidin:** Helpful to reduce vascular inflammation. Significantly reduce the blood glucose and oxidative stresses.
- **Hydroxycinnamic Acids:** Hydroxycinnamic acids found in eggplant protect from side effects of chemotherapy. Hydroxycinnamic acid is antioxidant in nature and produces free radicals for removing unwanted waste materials of the body.
- **Isorhamnetin:** Potentially useful in the treatment of human hepato-cellular cancer cells. They are also prevents the endothelial cell injuries caused by oxidized low-density of the lipoprotein.
- **Kaempferol:** Kaempferol secondary metabolites of the eggplant fruit and having the property defence of against free radicals, reduces the risk of chronic diseases, especially cancer.
- **Lutein:** Lutein present in the eggplant is non-provitamin-A carotenoids acting as antioxidant in retina and protects the eyes from oxidative stresses and inflammation.
- **Luteolin:** Luteolin found in the eggplant has several biological and pharmaceutical properties. They are antioxidant, anti-inflammatory in nature and useful in the treatment of useful in treating atherosclerosis.
- **Myricetin:** Myricetin is one of the wonderful secondary metabolites of eggplant fruits acts as anti-carcinogenic, antiviral, antimicrobial and anti-platelet activity. They are also helpful in protection of cell and cytoprotective in nature.
- **Quercetin:** Quercetin found in the brinjal fruits has the property of antioxidant. They are useful in for the improvement of normal cell survival in the body. They have property of antiviral, antibacterial and muscles relaxation.
- **Tannins:** Eggplant fruit is the good source of tannins and inhibit adipogenesis by enhancing glucose uptake.
- **Zeaxanthin:** Zeaxanthin present in the eggplant is pro-oxidant in nature and having the property of strong antioxidant. They are beneficial for the anti-inflammatory effect on the retinal tissues of the eyes.
- **B–Cryptoxanthin:** B–Cryptoxanthin is found in the eggplant as plant secondary metabolites. B –Cryptoxanthin is the potent precursor of the vitamin – A. They help to prevent the damage of biomolecules by free radicals. B – Cryptoxanthin is also helpful in the treatment of certain cancer in ayurveda.

CONCLUSION

Eggplant is economically important crop of the solanaceae family because of the significant role in the several pharmaceutical and medicinal areas. The health maintenance compounds present in the eggplant antioxidants and phenolic compounds have great opportunity to explore the future research activities. Rather than secondary metabolites present in the eggplant, some additional primary metabolites or primary plant products like amino acids and carbohydrates may also the indicator of good health. The other bioactive compounds, vitamins, nutrient minerals etc. would must be recognize eggplant to carried out the nutritive and pharmaceutical property in the future research and also in the biochemical estimation for future crop improvement.

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Colony Collapse Disorder- A Major Threat to Beekeeping Industry

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INTRODUCTION

Honeybees are considered as a keystone species because of the significant role they play in supporting various ecosystems and biodiversity through their massive pollination services. United Nations (FAO) estimated that bees pollinate 70% of crop species that provide 90% of food supplies worldwide. More than 1/3rd of the crop production depends on bee pollination. Bees do not pollinate the crop plants intentionally; they are pollen and nectar feeders which end up by providing this valuable pollination. In 2006, it has been reported that bee colony were dying in mass and was first reported from USA. Such mysterious dying of bees is called as colony collapse disorder. The ecological and economic contributions of honeybees are invaluable, which makes colony collapse disorder a major threat to bee keeping industry and we cannot afford the losses of bees, than what is going on or what is happening to bees.

CCD rises following questions:

1. What is CCD
2. Is there any symtomological characterization of CCD
3. What are the possible contributing factors to cause CCD

What is CCD?

The phenomenon that occurs when the majority of worker bees in a colony disappear and leave behind a queen, plenty of food and a few nurse bees to care for the remaining immature bees and the queen.

Symptoms of CCD

In collapsed colonies

- Complete absence of adult bees in colonies, with few or no dead bees in or around colonies
- Presence of capped brood

Presence of food stores (both honey and bee bread) that are not robbed by other bees or typical colony pests (small hive beetles, wax moths, etc.). If robbed, the robbing is delayed by a number of days.

In collapsing colonies

- ❖ Insufficient number of bees to maintain the amount of brood in the colony.
- ❖ Workforce is composed largely of younger adult bees.
- ❖ Cluster is reluctant to consume food provided to them by the beekeeper.

In light of the important ecological and economic values of pollinators, there is a need to take immediate action to identify the possible contributing factors associated with the declining numbers of pollinators in order to sustain crop production and to conserve the biodiversity. The following factors are considered as the possible causes of CCD.

1. Parasites
2. Diseases
3. Malnutrition
4. Genetic diversity
5. Electromagnetic radiation
6. Pesticides

The incidence of parasites and diseases will occur only when the colony become week. So the question is how the colony become week, it may be due to the Malnutrition, lack of genetic diversity, Electromagnetic radiation and pesticides which may be responsible for causing CCD. These factors are discussed below one by one as how they are responsible for CCD.

1) Malnutrition: Malnutrition is a consequence of shipping bees cross-country to pollinate a crop. Most of the bees used for commercial pollination are placed in areas where only one crop is available resulting lack of a good mix of pollens required to rear healthy bees so it may cause weakening of bees defence against parasites and diseases. This may also because, it is often hard to find the natural food e.g. (1) Foraging habitat converted to houses, streets, highways, shopping malls, parking lots, airports and runways resulting increases in habitat loss and decreases in nectar and pollen biodiversity which may leads to CCD.

2) Lack of genetic diversity: Genetic diversity in managed honeybee colonies is another factor contributing to colony collapse disorder. The shortage of genetic diversity may be causing honeybees to become more susceptible to disease, despite the fact that honeybees have numerous defences against parasites and pathogens (Oldroyd, 2007). As artificial insemination of queens and honeybee domestication become more common and as the honeybee gene pool becomes smaller, infestations of parasites and pathogens will become more common which may be responsible for CCD. As higher the genetic diversity within a hive, the more resilient the hive is to parasites and pathogens.

Electromagnetic radiation: Electromagnetic radiation (EMR) can be defined as energy propagated through space that exhibits wave-like. Honeybees, like other animals, use the Earth magnetic fields for navigation purposes. It is thought that electromagnetic fields can act on the dendrites and the signal is amplified by the hairs, as a result generating a stimulus in the nerve. Rapid development of cell phone towers, alter the behavioral pattern of bees when they are in close proximity to mobile phones and towers. The vanished bees are never found, but thought to die singly far from home. The massive amount of radiation produced by towers and mobile phones affecting the navigational skills of the honey bees because when an electromagnetic beam passes through tissue or other absorbing matter, part of its energy is absorbed causing thermal effects and preventing them from returning back to their hives.

Table 1: Change in colony status of honeybees exposed to mobile phones

Parameter	Control	10 days After exposure
No. of worker bees leaving the hive entrance/ minute)	40.7±15	
Before exposure	41.5±14	38.2±12
During exposure	42.4±14	18.5±13
After exposure		Nil
Returning ability	42.5±15	
Before exposure	43.6±14	39.5±14
During exposure	44.6±13	15.6±13
After exposure		Nil
Bee strength		
Before exposure	9 Frame	9 Frame
During exposure	9 Frame	5 Frame
After exposure	9 Frame	1 Frame
Egg laying rate of queen /day		
Before exposure	365.25	355.10
During exposure	362.15	198.60
After exposure	350.15	100.00

(Sainudeen, 2011)

(4) Pesticides: Agriculturalists use chemicals on plant crops to deter or kill unwanted insects. Honey bees may come in contact with pesticides as they collect pollen from these sources and transport it back to the hive. Contamination of the hive would cause the bees to leave or die off. Among the pesticide one of the classes of insecticide i.e neonicotinoids is making headlines or burning issue around the world. The neonicotinoids are the new group of insecticide which act by blocking the nicotinic acetylcholine receptor in the post synaptic membrane. Exposure to these insecticides may affect the memory formation gene (*creb* and *pka*) and foraging activity of bees.

❖ **Primary routes of neonicotinoid exposure to bees**

Primarily bees may come in contact with neonicotinoid exposure via direct contact while foraging during bloom, Exposure to residues after heavy dew, Drift on non-crop flowering vegetation. These exposures may cause acute, chronic and sub lethal effects resulting death of bees. There are 100 fold variations in acute toxicity according to kind of bee and season. This variation in sensitivity could explain why some colonies die from CCD and other do not.

❖ **Secondary routes of neonicotinoid exposure to bees**

Residues in plant fluids released by guttation droplets

Residues in contaminated water (i.e. spills, irrigation)

Residues in nectar and pollen represent the major route of neonicotinoid exposure to bees.

CONCLUSION

Colony Collapse Disorder poses a greater threat to the beekeeping industry as they affect crop production and productivity. A perfect storm of stressors is putting the honeybees at risk of extinction. Due to the lack of diversity within agro-ecosystems to support healthy pollinator communities so humans will be at risk losing one of our most valued necessities, food. No single factor is responsible for colony collapse disorder. Among all the discussed factors, pesticide particularly neonicotinoids are of greater concern in different parts of the world in the recent years. As neonicotinoids are systemic pesticides, they are easily translocated through the plant system and are found in floral parts such as pollen and nectar etc. which could either alter the behavior or kill pollinators**.** There is a greater variation in sensitivity of the honeybees to neonicotinoids and the exact cause of CCD, still unknown so

an extensive research is needed to evaluate reason behind CCD.

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Do Insects Reproduce Asexually?

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INTRODUCTION

In insects, sexual reproduction is widespread, although single-individual reproduction is also frequent. Asexual reproduction happens when a single female or hermaphroditic creature produces offspring without the involvement of a male.

Parthenogenesis: Most insect orders have at least one species that reproduces asexually through **PARTHENOGENESIS**. Unfertilized eggs develop into embryos without the involvement of a male, frequently resulting in genetic clones of the mother. When males aren't present, this happens to numerous stick insects in the Phasmatodea order. Some parthenogenic stick insects' reproductive cells go through meiosis, which results in haploid cells. These subsequently fuse together to return the cells to their original diploid state, however the cells' genomes will be somewhat altered due to the cross-over processes that occur during meiosis. Other stick insects' reproductive cells never go through meiosis, which resulting in offspring who are genetically identical to their parents. Both of these modes of parthenogenesis have been observed in other insects and creatures.

Parthenogenesis combined with oviparous sexual reproduction is a feature of several complicated insect life cycles, such as that of many aphid species. Female aphids make genetic clones by reproducing asexually in ideal environmental conditions. In this instance, aphid populations can quickly expand in order to take advantage of the high-quality plant host. To add to the complication, the newborn aphid daughters already have growing embryos inside of them, making a pregnant mother aphid also an expecting grandma! While conditions are favourable, these offspring are created through viviparous parthenogenesis for numerous generations.

Female aphids begin to generate males by removing one of the X chromosomes from their offspring's genome as temperatures drop and photoperiods shorten, and many aphids revert to oviparous reproduction at this time. Male aphids are absent for the majority of the year and only appear at particular seasons of the year. This shift from asexual to sexual reproduction allows groups to mix genetically. **Holocyclic** reproduction is characterised by periods of asexual reproduction interspersed with times of sexual reproduction.

Parthenogenesis can also be seen in Hymenoptera. Male hymenopterans are born from unfertilized eggs, whilst females are born from fertilised eggs. Male hymenopterans are haploid because they are born from unfertilized eggs with only one set of chromosomes. Like most creatures, the fertilised eggs from which females develop are all diploid and have two sets of chromosomes. **Haplodiploidy** is the name for this type of sex determination mechanism.

Polyembryony: Other odd reproductive techniques are used by a tiny number of insects. POLYEMBRYONY is an unusual mechanism of reproduction found primarily in endoparasitic insects. A single egg separates into numerous embryos in this scenario, the same mechanism that produces identical twins in adults. This occurs in some parasitoid wasp species, when the ovipositing wasp expends minimal energy to create a large number of progeny within the parasitized host. Furthermore, because the parasitic wasp only needs to oviposit once to create a large number of offspring in the host, she is less vulnerable to predation and other hazards.

The number of embryos that can be created from a single egg can range from 10 to over one thousand! The embryos created from the initial egg do not get their nutrition from the egg yolk; instead, they get all of their energy from the parasitic host. When the larvae reach the end of their development, they leave the host and weave a silken pupal case from which a free-living adult emerges.

Paedogenesis: Another unusual reproductive technique involves juveniles who have children of their own because children these days grow up so quickly. Some insects shorten their life cycles by reproducing while still in the larval stage, skipping the pupal and adult stages. Insects with reproductively mature juveniles create progeny through PAEDOGENESIS, and these juveniles rarely grow into adults. Individuals who are paedogenic are frequently parthenogenic and viviparous.

Paedogenesis, like parthenogenesis in aphids, could be part of a complex life cycle in which adult females are only generated under certain conditions and most reproduction takes place in female larvae. In the Cecidomyiidae family of gall midges, this form of reproductive technique has evolved several times (Order Diptera). The reproductive system of paedogenic gall midge larvae matures quicker than the rest of the body, allowing eggs to be laid during the larval stage, or occasionally during the pupal stage. Because a female gall midge may govern the sex ratio of her own offspring, the eggs generated may result in male or female offspring. When female gall midge larvae are exposed to inadequate conditions, they can reproduce through paedogenesis or metamorphosis into adults, which may benefit the individuals. Male gall midge larvae are always able to complete their life cycles and become adults. The paedogenic progeny of some gall midges develop within the mother larva and eat her before emerging into the external world.

Most species of the parasitic order Strepsiptera (twisted-wing parasites), as well as beetles in the genus *Platerodrilus* (trilobite beetles), reproduce exclusively in the larval stage. Females never metamorphosis into adults in these groupings, and only males experience an adult dispersal stage. We can see from these and other situations that paedogenesis is not confined to asexual reproduction, but can also include sexual reproduction.

As previously stated, depending on the time of year, aphids can be parthenogenic and display viviparity. Because newborn aphid daughters already have their own growing embryos, they are paedogenic! They have paedogenic viviparous parthenogenesis, which implies they can produce children. These reproductive techniques aren't mutually exclusive, as you can see from this example.

Hermaphroditism: The fourth unusual kind of insect reproduction we'll explore is HERMAPHRODITISM, which happens when both male and female reproductive structures are present in a single organism. Because each individual possesses both male and female reproductive systems, hermaphroditic insects may fertilise themselves. Sexual reproduction between people happens in this reproductive method as well, analogous to paedogenesis.

Hermaphroditism is a rather uncommon reproductive strategy in insects, despite its widespread appearance in vertebrates. This is not to be confused with gynandromorphism, which occurs when a person possesses both female and male traits but not necessarily both functional reproductive systems. Only a few species of scale insects of the genus *Icera*, a group of hemipteran insects that are frequently horticultural and agricultural pests, are functioning hermaphrodites. True males are exceedingly rare in these insects, with the majority of the population being functioning hermaphrodites that self-fertilize.

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Multi Dimensions of Mycotoxins, Its Cause, Effect and Management

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INTRODUCTION

Basically, mycotoxins are secondary metabolites produced by a variety of molds on several agricultural commodities under specific environmental conditions. The term mycotoxin was first used in the 1960s to describe the toxin associated with contaminated peanuts in animal feed and the loss of turkeys in England and the disease was named as Turkey X disease. This mycotoxin was later identified as the *Aspergillus flavus* toxin AflatoxinB1 (Bean & Echandi, 1989). A broad spectrum of acute and chronic diseases in livestock is due to mycotoxins, whichcan remain as a residue in meat and milk, posing a possible threat to human health. The amountand type of mycotoxin varies with environmental conditions such as temperature and humidity.

Contrastingly, these are a structurally different group of fungal natural products that share the ability to cause harm to vertebrate animal or human health when they are contaminants of animal feed or food. A primary inoculum of the fungus onto the feed is necessary for the fungus to develop, but abundant spores are usually present in soil, air and water. The toxigenic fungal spores are ubiquitous in nature. They can germinate, grow and elaborate their toxins into a variety of substrates when conditions of moisture, temperature and aeration are favorable. The optimal conditions for toxin production by different fungi may be quite variable from one to other.

On contrary, the mycotoxins of major concern are the aflatoxins, ergot, trichothecenes (including deoxynivalenol (DON), nivalenol (NIV), T-2 toxin and HT-2 toxin), patulin, citreoviridin, ochratoxin, the fumonisins (FB) predominantly fumonisin B1 (FB1), zearalenone(ZEN), the ochratoxins, predominantly ochratoxin A (OA) and vomitoxins. Whereas, aflatoxins (AF) are of major concern in food and feedstuffs imported from warmer tropical and subtropical regions.

VARIOUS MYCOTOXINS THAT AFFECT HUMANS AND CATTLE ARE:

Aflatoxins:

Effects in humans:

The deuteromycete fungus *Aspergillus flavus* produces the mycotoxin known as aflatoxin on a number of crops including cotton, peanut and corn. Different types of aflatoxin are produced by the fungus. Among all the mycotoxins Aflatoxin B1 is considered to be the most toxic and is produced by both *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxin G1 and G2 are produced exclusively by *A. parasiticus*. The main effects of aflatoxin are related to liver damage called as cirrhosis. If the dose is sufficient to produce an acute toxicity, it results in an increased clotting time and hemorrhage, especially in the intestinal lumen.

In sub-acute cases of poisoning, the liver lesions are those of regeneration and repair rather than cell necrosis. The bile duct cells proliferate and scar tissue forms. The rate of protein formation and the growth rate are depressed but the animal may not die. In chronic cases, the lesions are those of chronic liver dysfunction. These usually include icterus, fibrosis or cirrhosis of the liver, ascites and pulmonary edema. The changes may be so subtle that they are overlooked, but it can result in decreased appetite, poor feed conversion, reduced growth rate and decreased resistance to disease. It may also cause diarrhea, bloody diarrhea, abortion, or deformities of the fetus.

Effect on animals:

In case of young animals are usually more sensitive than are older ones. In calves, 150–200 ppb (or 0.5 mg/day) results in unthrifty animals. It would require 300–400 ppb to cause first calf heifers to lose weight and 2400 to 3100 ppb to reduce the appetite and markedly decrease production of adult dairy cows. However, 10,000–12,000 ppb (10–12 ppm) would cause the death of an adult cow in about five days. Even lower levels may have an effect in the farm situation, compared to when a purified toxin is used in the laboratory. This is evidently due to the synergistic effects of other molds and their products in the farm situation. Apart from cattles, even the Human exposure to aflatoxin can result from direct consumption of aflatoxin contaminated foods, whether processed or unprocessed. Aflatoxin ingested by food producing animals may also be transferred within the animal's body into meat, milk, or eggs and these would be potential sources for human exposure. Aflatoxin contaminated foods are deemed adulterated.

ERGOT:

Ergot alkaloids are compounds produced as a toxic mixture of alkaloids in the sclerotia of species of *Claviceps*, which are common pathogens of various grass species. There are two forms of ergotism: gangrenous, affecting blood supply to extremities, and convulsive, affecting the central nervous system. Modern methods of grain cleaning have significantly reduced ergotism as a human disease, however it is still an important veterinary problem. Ergot alkaloids have been used pharmaceutically. Ergot is the sclerotium (resting stage) of parasitic ascomycetes of the genera *Claviceps*, notably *C. purpurea*, (*Clavicipitaceae*), which replace the seeds of susceptible grasses, commonly rye (*Secale cereale* L.).

TRICHOTHECENE:

The yellow controversy: Trichothecenes belong to a very large family of chemically related mycotoxins. The trichothecene mycotoxins is used as biological weapon in Southeastern Asia. It is commonly called as "yellow rain". Which is producedby *Fusarium*, *Myrothecium*, *Trichoderma*, *Trichothecium*, *Cephalosporium*, *Verticimonosporium* and *Stachybotrys spp*. Trichothecenes belong to sesquiterpene compounds.

DEOXYNIVALENOL (DON): It is commonly called as Vomitoxin, it is a type B Tricothecene. This occurs predominantly in cereals *viz*., barley, wheat, oats, rye etc., it is primarily associated with the *Fusarium graminearum* and *F. culmorum* which causes fusarium head blight in corn. These are the

strong inhibitors of protein synthesis, exposure to this toxin causes the brain to decrease the uptake of the amino acid and in turn the synthesis of tryptophan. Large consumption of vomitoxin pose acute toxicity in humans.

NIVALENOL (NIV): It is a sub group of trichothecene group. It is commonly found in fungi of the *Fusarium graminearum* species. The history of nivalenol dates back to 1946-63, intoxication of Fusarium infected grains caused intoxication in humans and cattles.

PATULIN

It is a potent protein synthesis inhibitor and is also regarded as genotoxic. In animal toxicity studies, the effects observed include reduced weight gain, impaired kidney function and intestinal effects.

CITREOVIRIDIN

It is a neurotoxin in animals, resulting in paralysis and muscular atrophy.

OCHRATOXIN

Ochratoxin is a mycotoxin that comes in three secondary metabolite forms, A, B, and C. it is named after the species which produces it *i.e.*, *Aspergillus ochraceus* and some mycotoxins are also produced by *penicillum* species. The three forms differ in that Ochratoxin B (OTB) is a non-chlorinated form of Ochratoxin A (OTA) and that Ochratoxin C (OTC) is an ethyl ester form Ochratoxin A. *Aspergillus carbonarius* is the main species found on vine fruit, which releases its toxin during the juice making process. OTA has been labeled as a carcinogen and a nephrotoxin, and has been linked to tumors in the human urinary tract, although research in humans is limited by confounding factors.

ZEARALENONE

It is an oestrogenic substance with relatively low overall toxicity but it has been shown to have uterotrophic (anti-reproductive) effects in pigs. The effects of this mycotoxin in humans are not clearly established.

TREATMENT

Basically efforts of treatment are directed to removal of the contaminated feed and good nursing care of the animals. All surgical procedures should be delayed until the liver function and blood clotting mechanisms have returned to near normal.

DETECTION OF MYCOTOXINS

The techniques used for detecting the known mycotoxins are quite advanced and range from methods for directly detecting the toxins themselves based upon their physical characteristics, indirectly through immunoassays. The methods like physicochemical methods such Gas chromatography (GC), High performance liquid chromatography (HPLC), Thin layer chromatography (TLC), Enzyme linked immune sorbent assay (ELISA), Radio-immunoassay(RAI).

AFLATOXIN LEVEL FOR HUMAN AND ANIMAL CONSUMPTION

Aflatoxin concentration	Affects on animal health
20 ppb	Highest level allowed for humans
50 ppb	Highest level allowed for animals
100 ppb	Slowed growth of young ones
200-400 ppb	Slowed growth of adults
>400 ppb	Liver damage and cancer

Lava Kumar et al. 2009

CONCLUSION

The mycotoxins though shows effect on both Humans and Cattles, it is said to be harmful only when the amount of it increases than the normal. So, anything which is in normalis said to be feasible for the consumption. And if it exceeds the normal proper detection and treatments should be taken up to diagnose and several management methods have to be taken to reduce the toxin levels of the fungus in the food commodities. These management methodscan be single or integrated in order to reduce the effects of the mycotoxins.

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Peculiar Features of Flowering and Seed Formation in Groundnut

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INTRODUCTION

Agriculture plays a vital role in the economy of Assam contributing about 35% to the State Domestic Product. The Assam government has, therefore, assigned very high priority to agriculture. This was reflected through a quantum of jump in the production of main crop of Assam i.e., rice upto 51.25 lakh MT per annum. In an agrarian state like Assam, which is predominant by rice crop, the oilseeds production had increased its area upto 5%, surpassing pulses, having an area coverage of only 2.3% of the total cropped area. Although the major oilseed crops grown in Assam are rapeseed (toria), the other oilseed crops cultivated mainly during *rabi* season are sunflower, groundnut and niger, whereas, sesamum and soybean are cultivated during *kharif* season. The rapeseed and mustard cover an area of about 2.25 lakh hectares (71%) of the total oilseeds coverage area (2015-16). The overall productivity of oilseeds in Assam is around 644 kg/ha (2015-16), which is slightly more than half of the national average (1095 kg/ha). In Assam, the oilseeds are grown mostly under *rainfed* condition with low level of modern agro technique. Although regular flood, drought, heavy population pressure on land and infrastructural weakness are impediment to growth, yet the farmers have started to increase production through technological innovations and appropriate government policies. In respect of oil seeds, although the state is deficit, there is scope to mop up the deficit and become surplus. The cultivation of groundnut in rabi season in some pockets of North Bank Plains Zone of Assam is gaining popularity as oilseed crop. Therefore, an experiment as well as demonstration plot was carried out under All India Coordinated Research Project on Dryland Agriculture, Biswanath Chariali Centre of Assam Agricultural University in the *rabi* season of 2020.

Among the oilseeds crops, groundnut (*Arachis hypogaea*. L) family Leguminosae has first place in India and the oil is primarily used in the manufacture of vegetable oil (vanaspati ghee). The groundnut seed contains about 45% oil and 26% protein and the kernel as a whole is highly digestible. Groundnut is a good source of all B vitamins except B_{12} alongwith rich source of thiamin, riboflavin, nicotinic acid and vitamin E. Although groundnut is an oil and protein rich energy giving crop, but usually grown under energy-starved conditions of low soil fertility and *rainfed* areas. In north-east India, the crop is mainly used as snack food and cultivated area is limited mainly due to acidic nature of soil as well as less popularity as oilseed crop compared to toria in terms of preference of consumption. In Assam, groundnut can be grown in all the three seasons *viz*., *kharif* (June-July), *rab*i (Mid September-Mid October) and *summer* (Mid January -February). The production technology of the crop for each season is already developed and included in state package of practices published jointly by Assam Agricultural University and Department of Agriculture, Assam. In the *kharif* season (July to September) of Assam, *Sali* rice is the main crop grown throughout the state in medium and low land situations due to which farmers are less interested to grow other crops than rice in *kharif* season. Moreover, due to monsoon, Assam experienced heavy rainfall from July to September (more than 1000 mm) and there is every possibility of water stagnation even in upland situation for a few days. So, *rabi* season may be the best option for groundnut cultivation in Assam. Groundnut variety "Kadiri 6" having duration of about 130-140 days was collected from Agricultural Research Station, Ananthapuramu - 515001, Andhra Pradesh under AICRP on Dryland Agriculture, Biswanath Chariali Centre of Assam Agricultural University. The crop was sown on 27.11.2020 and harvested on 02.05.2021.

The most peculiar phenomenon of the groundnut crop observed was the manner of flowering and seed formation. (Photograph attached). Groundnut is predominantly a self pollinated crop and pollination takes place early in the morning. As soon as the fertilization is complete, the flower fades. Flowers are borne in the axils of the leaves. Flower color of the variety was yellow to orange. Flowers open early in the morning as soon as they receive light. Pollination occurs just before the flowers open. After pollination the pollen tube grows resulting in fertilization. After fertilization the flower withers and in doing so activates the growth and the intercalary meristem, becomes active at the base of the ovary. A stalk-like structure (the gynophores) that bends downward and forces the ovary into the soil. The gynophores are refered to as peg which generally becomes visible within 4-6 days after fertilization. Peg extension is slow at first and takes about 5-6 days to penetrate the bracts. The peg carrying the ovary pushes itself into the soil. The peg bears the ovary with the fertilized ovule at its tips. The peg typically reaches and penetrates the soil surface in about 8-14 days after fertilization .Once the peg enters the soil and penetrates to a depth of 4-5cm, the tip of the ovary begins to develop and takes up a horizontally position and develops into a pod. This is the most striking features of seed formation and technically it is known as pegging. Pegging is a characteristic of growth of the embryo in groundnut. Groundnut is a rare example of the reproductive strategy called geocarpy, in which the seeds form and ripen in the ground beneath the plants.

Figure 1: Photographs of pegging in Groundnut Variety (Kadiri-6) in the demonstration plot of AICRPDA Biswanath Chariali

Figure 2: General view of the demonstration plot at AICRP on Dryland Agriculture Research field of Biswanath Chariali Centre, AAU, Assam

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Organic Farming, Its Influence on Soil Health and Production

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INTRODUCTION

Organic agriculture is "ecological production management system that promotes and enhances bio-diversity, biological cycles, and soil biological activity approaches based on minimal use of off-farm inputs ecological harmony" Organic farming is "a production system, which avoids or largely excludes the use of inorganic fertilizers, pesticides, growth regulators and livestock feed additives".

Why it is necessary?

With the development of high yielding varieties coupled with improved specified inputs such as fertilizers, pesticides, irrigation, etc., lead to environmental problems.

The soils become sick mainly due to the exploitation through:

- Use of selected and highly pure fertilizers.
- Use of irrigation without proper drainage.
- Employing poor quality waters and
- Dumping of industrial toxic effluents in to natural water courses.

Due to adverse effect of pollution of pesticide and fertilizer shown below organic farming is necessary.

Table 1:

Type of Pollution	Adverse effects of Pollution
Pesticides Related	Ground water contamination
	Residual effects in grains
	Accumulation into body tissue
	Causes cancer in human being
Fertilizer Related	Rise in concentration of nitrate in drinking which causes blue baby Syndrome and stomach cancer in human beings Rise in concentration of heavy elements into soil, Water and food.

Characteristics of organic farming:

1) Maximal but sustainable use of local resources
2) Minimal use of purchased inputs, only as complementary to local resources
3) Maintaining a diversity of plant and animal species
4) Ensuring the basic biological functions of soil-water-nutrients-humus continuum
5) Creating an attractive overall landscape, this gives satisfaction of the local people
6) Increasing crop and animal diversity in the form of polycultures, agro forestry systems, integrated crop/livestock systems, etc.

Objective of Organic farming:

1) To maintain high nutritional quality
2) To work with natural system rather than seeking to dominate them
3) To encourage and enhance the biological cycles with framing system
4) To maintain and increase the long term fertility of soils
5) To worked as a closed system with regard to organic matter and nutrient elements
6) To give all livestock, conditions of life allows them to perform all aspects of their innate behavior
7) To avoid all forms of pollution
8) To maintain the genetic diversity of the agricultural system
9) Allow agricultural producers an adequate return and satisfaction from their work including a safe working environment
10) To consider the wider social and ecological impact of the farming system.

Advantages of Organic farming:

1) Optimal conditions in the soil for high yields and good quality crops.
2) Improve soil physical properties such as aeration, root penetration and WHC.
3) Improve soil chemical properties and promote favorable chemical reactions.
4) Improve plant growth and physiological activities of plants
5) Reduce the need for purchased inputs.
6) Prevent environmental degradation and can be used to regenerate degraded areas.
7) Minimized the pollution
8) Provide healthier and nutritionally superior food.
9) Organic fertilizers are considered as complete plant food.

Why Do People Choose Organic Food:

1. **Better Taste -** Organic food tastes better; this is the simple message given by many people who eat organic.
2. **Healthier -** Organic foods have far less residues of pesticides, growth promoters and antibiotics. It has been shown in a number of studies that organic food contains more vitamins, nutrients and cancer-fighting antioxidants than non-organic food.
3. **Animal Friendly -** Organic farming places great emphasis on animal welfare and is more animal friendly, where animals are not treated with synthetic growth hormones or drugs.
4. **GMO Free -** Genetically Modified Organisms are not allowed in organic agriculture.

(1) International Standards

- Codex Alimentations Commission
- International Federation of Organic Movement (IFOAM). NGO

(2) Regional Standards

- European Union's Council Regulations EEC No.2092/91

(3) National Standards

USDA organic standards, Canadian organic standards, Australian organic standards, Tea Board, Coffee board, NOP in USA, Food safety Authority of Ireland, National Dairy Farm Assured Scheme (NDFAS) and Canadian sustainable Forestry certification coalition.

(4) Certification Standards

- Organic standards of Soil Association
- Organic Production standards of Netherlands and
- Organic standards of CCOF

Accreditation Agencies of Organic farming:

- APEDA
- Coffee Board
- Spices Board
- Tea Board
- Coconut Development Board
- Directorate of Cashew and Cocoa Development

Certifying Agencies in India

- ECOCERT International (Germany) - (IIRD, Aurangabad)
- SKAL International (Netherlands) - SKAL I & CA Banglore, Mumbai
- SGS India Pvt. Ltd. - Gurgaon, Delhi.

- Association for Promotion of organic farming - Banglore
- INDOCERT (India) - Aluva, Kerala
- IMO India Pvt. Ltd. (Switzerland) – Banglore

Table 2: Total Area under Organic Farming (Rank wise)

Rank	Country	Total area (Hectare)
1	**Australia**	**1,21,26,333**
2	China	34,66,570
3	Argentina	28,00,000
4	Italy	9,54,361
5	USA	8,89,048
6	Brazil	8,87,637
7	Germany	7,67,891
8	Uruguay	7,59,000
9	Spain	7,33,182
10	UK	6,90,270
31	**India**	**1,14,132**

www.fibl.org

Among all countries Australia rank first with area of 1, 21, 26, 333 hectares and India rank 31st with area of 1, 14, 132 hectares.

Components of Organic farming:

(1) Organic manures

(a) Bulky organic manures (b) Concentrated organic manures (c) Green manures

(i) Green manuring in situ (ii) Green leaf manuring

(2) Recycling of organic waste

(a) Compost (i) Vermicompost (ii) Phospho compost (iii) Bio compost

(b) Crop residue management

(3) Bio fertilizers (4) Integrated nutrient management

(5)Non-chemical weed control measures (6) Biological pest management

Table 3: Nutrient content of different organic manures

Organic manure	Nutrient content		
	N%	P2O5%	K2O
FYM	0.5	0.20	0.5
Farm compost	0.5	0.15	0.5
Town compost	1.4	1.0	1.4
Night soil	5.5	4.0	2.0
Poultry manure	3.03	2.63	1.4
Neem cake	5.22	1.08	1.48
Linseed cake	5.56	1.4	1.28
Groundnut cake	7.29	1.53	1.33
Fish manure	4-10	3-9	0.3-1.5
Row bone meal	3-4	20-25	-
Steamed bone meal	1-2	25-30	-
Blood meal	10-12	1-2	1.0

Singh et al. (2003)

Soil health:

Soil health can be defined as the "the continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the quality of air, water and environments, and maintain plant, animal, and human health".

In general term that describes the ability of a soil to function.

Soil health governed by the following factors:

(1) Soil physical properties
(2) Chemical properties and
(3)Biological properties

Functions of some important properties of soil for plant

Aeration	:	Roots require oxygen for respiration and nutrient uptake
Organic matter	:	The reservoir for nutrients
Soil pH	:	Regulates nutrient availability
Soil type	:	The heavier the soil the greater the ability to store nutrients
Moisture	:	Needed to dissolve nutrients in order to be absorbed by roots
Microorganism	:	Breakdown organic matter to release nutrients
Bulk density	:	Low bulk density create favorable physical condition
C:N ratio	:	Decomposition of organic matter

Influence Of Organic Farming Practices On Production:

Green Manuring:

Effect on:

1) Macro and secondary nutrients	2) Micro nutrients
3) Yield of crops	4) Reclamation of alkali soils
5) Residual activitiesn	

Vermicompost

Advantages:

a) Favorable on soil biological life.	**b)** Increase water retention capacity of soil.
c) Increase the aeration of soil.	**d)** Promote establishment of microorganisms.
e) Production of better quality of compost. f)	**Addition of auxins and actinomycetes.**

Integrated Nutrient Management:

Necessary due to:

1. Introduction of high yielding varieties	2. Increased use of fertilizers.
3. Depletion of organic matter.	4. Higher prices of fertilizers
5. Deficiency of micro nutrients	

CONCLUSION

Organic farming is a welcome alternative by two angles for farmers it is less financial draining, for the environment which will be less taxing to eco system and would help to improve soil fertility. Quality of agricultural produce improves by organic manures than fertilizer because of the supply of all the growth principles besides all the essential plant nutrients. As a result metabolic function get regulated more effectively and hence improvement in the quality of produce. Food production of world fluctuates widely from place and year to year. As such, organic farming can ensure a ray of hope to sustain and increase productivity levels. The traditional organic farming coupled with bio-inputs like bio fertilizers, effective microorganisms and bio-pesticides may help to achieve the stability in agricultural production.

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Deficit Irrigation: A Boon to Horticulture

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INTRODUCTION

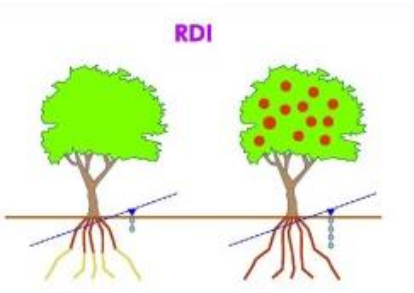
Water is becoming scanty resource worldwide due to its increased consumption, mismanagement and pollution. The predicted increase of dry days per year for many areas of the globe will further worsen the problem. The major consumer of water is irrigated agriculture which accounts for about two thirds of the total fresh water diverted to human uses. In the global debate about water scarcity, agriculture is commonly associated with the image of inefficiency. This is due to poor irrigation water use efficiency. The increasing demand of water resources and limited availability makes water an increasingly valuable commodity. Water scarcity (in quantity and quality) and the increasing competition for water resources between agriculture and other sectors are forcing growers to consider the adoption of water saving strategies more seriously especially in areas of intensive horticulture production and limited water resources. As a result, improving crop water-use efficiency has been a matter of concern to researchers in recent years.

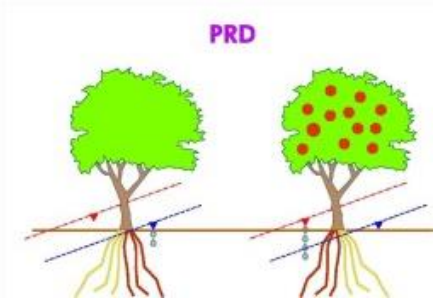
What is deficit irrigation: When irrigation is applied during drought-sensitive growth stages of a crop and irrigation is limited or even unnecessary outside these periods, it may be termed as deficit irrigation. It allows the crops to sustain some degree of water deficit and sometimes, some yield reduction with a significant reduction of irrigation water. The classic deficit irrigation strategy implies that water is supplied at levels below full evapo-transpiration throughout the season. When irrigation is applied at rates below the ET, the crop extracts water from the soil reservoir to compensate for the deficit. If the stored soil water that was extracted is replenished by seasonal rainfall, the deficit irrigation practice is sustainable and has the advantage of reducing irrigation water use. Deficit irrigation strategies have the potential to optimize water productivity in horticulture, improve nitrate use efficiency and minimize leaching of nutrients.

Nevertheless, the effects of deficit irrigation on yield or harvest quality are crop-specific. Knowledge of how different crops cope with mild water deficits is the basis for a successful application of deficit irrigation into practice. Based on the physiological knowledge of crops response to water stress, the two main deficit irrigation strategies are regulated deficit irrigation and partial root-zone drying.

1. Regulated deficit irrigation: The main principle is that plant sensitivity to water stress is not constant during the growth season and that intermittent water deficit during specific periods may benefit water-use efficiency, increase water savings and even improve harvest quality. Plant water status is maintained within certain limits of deficit during certain phases of the crop cycle, normally when fruit growth is least sensitive to water reductions.

2. Partial root drying: It involves exposure of roots to alternate drying and wetting cycles, which can be operated in drip or furrow-irrigated crops. This will decrease water loss and vegetative growth and increase water-use efficiency. The partial root drying strategy may also increase root growth at deeper layers of the soil as for grapevine or in overall root system, as for tomato. It can influence carbohydrates partitioning between the different plant organs and affect the quantity and quality of the harvest.





Important points for deficit irrigation:

- Before implementing a deficit irrigation programme, it is necessary to know crop yield responses to water stress, either during defined growth stages or throughout the whole season.
- High-yielding varieties are more sensitive to water stress than low-yielding varieties.
- Crops or crop varieties that are most suitable for deficit irrigation are those with a short growing season and are tolerant of drought.
- In order to ensure successful deficit irrigation, it is necessary to consider the water retention capacity of the soil. In sandy soils, plants may undergo water stress quickly under deficit irrigation, whereas plants in deep soils of fine texture may remain unaffected by low soil water content. Therefore, success with deficit irrigation is more probable in finely textured soils.
- Under deficit irrigation practices, agronomic practices may require modification, e.g. decrease plant population, apply less fertilizer, adopt flexible planting dates, and select shorter-season varieties.

Benefits:

- Deficit irrigation strategies can be successfully applied to several important horticultural crops, in particular to those that are typically resistant to water stress in order to improve water-use efficiency and save water. Major horticultural production areas are located in hot and dry climates where high light, high temperatures often co-occur with low soil water content. Thus, deficit irrigation strategies may help to save more water and optimize or stabilize yields and quality in these areas and they have been investigated for several horticultural crops, namely grapevines, orchard fruit trees and

vegetables. In many horticultural crops, regulated deficit irrigation has been shown to improve farmers' net income.

- The deficit irrigation strategies offer great opportunities for saving water without compromising production. Under regulated deficit irrigation strategy, water is saved from 43% to 65% with a small reduction in yield, but with higher quality of produce. In general, the fruit and vegetable yield reduced in deficit irrigation system by size and weight reduction of produce, but quality parameters contents in fruit increased by water restrictions. The adoption of deficit irrigation improves fruit composition of orange, peach, and grape by improving key functional quality parameters. Similarly, vegetable crops such as melons, cucumber, tomato, brinjal, and spinach have shown poor-quality water use efficiency without much loss of yield, but with added produce quality.
- Combination of deficit irrigation strategies with other practices like mulching, or protected cultivation may also help to improve water-use efficiency and minimize losses in yield or quality in vegetable crops. Grafting on specific rootstocks more adapted to water stress conditions may be another tool to improve crop growth response under artificially imposed mild water stress.

Disadvantages:

- The major disadvantage of the regulated deficit irrigation is that it is required to maintain a plant's water status within narrow limits, which is difficult to achieve in practice.
- A practical inconvenience of partial root drying is that it obliges to use double the amount of tubes than regulated deficit irrigation, thus, increasing the installation costs.
- Greater risk of increased soil salinity due to reduced leaching, and its impact on the sustainability of the irrigation.

Both water use and consumption are reduced by deficit irrigation but yields may be negatively affected.

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Indoor Cultivation of Chinese Bamboo

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INTRODUCTION

Chinese Bamboo (*Dracaena sanderiana*) a native to Central Africa is a species of flowering plant. The plant is commonly known as "lucky bamboo". It has become the most popular indoor plant in certain parts of India.

It is much easier to grow as a houseplant. The Chinese bamboo is the most renewable plant due to its ability to grow at a fast rate.

STEPS TO GROW LUCKY BAMBOO

1. Choose your plant - Get a plant with bright green leaves. If the stems or leaves are yellow or brown, don't use it as the plant is unhealthy. For professional growing, take the stalks and curl them into an intricate design.
2. Decide how you want to grow it - It's quiet easy and clean to grow it hydroponically in water and stones, though it can also be grown in soil.
3. If you want to grow it hydroponically, the container you are going to use should have enough stones or marbles in the bottom to balance or stabilize it.
4. The Chinese bamboo requires at least 1-3 inches of water to thrive. For growing it in soil, well-drained and rich potting soil is perfect. It requires to be moist but not soaked. Also, add some small rocks to the bottom of the pot in case of soil too for proper draining.
5. Select the right container - Either Put the bamboo plant in a tall glass vase/ ceramic container or leave it in the container it comes in.
6. Use a clear container for growing the plant hydroponically and use a regular pot in case of growing it in soil.
7. Mendatory- Select a pot 1 foot (30 cm) in height as the plant will required to be stabilized at its peak height. For soil, fill the pot up most of the way with your rich soil and make sure it has proper drainage.

8. Choose the right spot -It will grow best best in bright and filtered sunlight. Direct sunlight is harmful for the leaves.
9. Keep the plant away from the air conditioning or vent as the requires an air temperature between 65ºF - 90ºF.
10. Water - If you are growing it hydroponically, change the water every week. The plant is sensitive to levels of flouride and chlorine, so use water accordingly. For soil, water to keep it moist, do not make it soggy.
11. Fertilize the plant every month - For soil, use organic fertilizers or so for fulfilling the nutrition requirements.
12. For hydroponic method, go for liquid fertilizers but keep in mind to dilute it to one tenth proportion as Chinese bamboo doesn't require much fertilizer.

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Small Ruminant Rearing in Jammu and Kashmir- A Brief Overview

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INTRODUCTION

High mountains, low hills and vast meadows in Kashmir provide enormous scope for small ruminant rearing. Further, sheep and goat rearing is the core occupation of many tribes *viz;* Gujjars, Bakerwals, Chopans, Gaddies and Changpas (Rather et al., 2019). Small ruminants (sheep and goat) play an important role in economy of Jammu and Kashmir. Thousands of poor marginal farmers and land less labours depend upon sheep and goat farming for their livelihood in J and K. The sheep and goat farming is a source of revenue for poor rural communities. It acts as cushion during crop failure and provides nutritional security to farmers at times of crises. Despite of these paybacks associated with sheep and goat farming, the sector in J and K is not exclusive of constraints. Therefore, this article explores the present status and constraints in small ruminant production in Jammu and Kashmir.

Importance of small ruminants of J&K

J and K is rich repository of sheep and goat genetic resources. Among the 43 registered breeds of sheep in the India; J&K contributes 6, viz. Bhakarwal, Changthangi, Gaddi, Gurez, Karnah and Poonchi and many other nonregistered breeds like Gaddi, Malluk, Purgi etc (Rather, et al., 2019). Similarly Gaddi, Purgi, Bhakarwal, Kashmari and Changthangi are important goat genetic resource of J and K. The overall sheep and goat population of J and k is 3.248 and 1.730 million, respectively (Anonymous, 2019). The silent features of small ruminants of J and k are outlined below.

1. They provide high quality protein through milk and meat.
2. Provide hides, bone and valuable organic manure.
3. The production of *pashmina* shawls, carpets and blankets of Kashmir earn handsome foreign exchange.
4. They possess traits of adaptation to the harsh agro-climatic conditions and management conditions and traits for disease resistance.
5. They are easy to manage on low inputs.
6. These convert low quality feeds/ fodder in animal products (meat, milk, etc) efficiently (Rather et al., 2020 b).
7. They are also preserving the cultural and historical values hence sustain the inheritance value of livestock (Ganai et al., 2016).
8. They are backbone of any agrarian economy.

Constraints: Non-availability of feed and fodder particularly during winter months is important constraint (Khan et al., 2013) in small ruminant rearing in Jammu and Kashmir. Further, other constrants include low productivity, small flock size and lack of cooperative farming/ breed society. Further, sheep and goats are managed by weaker sections of society. Lack of scientific breeding programs, unhygienic and ill ventilated housing and unhygienic condition of the livestock can't be ruled out. Inaccessibility of farmers to pastures, overexploitation of pasture lands, depletion of forests and high costs of feed and fodder are among the major constraints which obliged farmers to restrict flock size to minimum numbers. Constraints to goat rearing farmers include non-availability of good breeding bucks and slaughter of elite breeding stock. Shrinkage of pastures due to encroachment and changes in horticulture practices like plantation of high density apple trees add to the constraints perceived by sheep and goat rearing communities. Poor health coverage, non-availability of veterinary hospitals/facilities in the remote areas and unawareness of farmers about livestock management add to constraints. The data recording is non-existing and no data base is available. Poor credit facilities Khalidet et al. (2014), high costs of feed and fodder, poor accessibility to veterinary services, inadequate capital resources, poor infrastructure, lack of sufficient funds, improper implications of existing schemes/ policies, poverty and illiteracy (Shah et al., 2018) are also among constraints. As such many of the existing sheep farmers are forced to shift to some other occupations therefore, discouraged new entrants into the profession (Shah et al., 2018). Inadequate extension activities for transfer of technology and communication gap between the traditional communities and concerned administrative units add to the scenario (Shah et al., 2018). Long and harsh winters and high feed and fodder costs. The mortality is a drag on litter size and number of lambs sold per ewe (Bashir et al., 2020) and therefore, has negative impact on income of poor farmers. Haphazard or indiscriminate crossbreeding has endangered indigenous sheep breeds of J&K. Therefore, conservation of local sheep breeds in particular Guraz and Karnah sheep is highly recommended and cross breeding should be restricted to nondescript population and abstained in breeding tracts of these breeds. No goat development or up gradation programme/ policy in vogue. Sheep Husbandry Department has considerably improved wool production in terms of quality and yield but the augmentation in mutton production is not impressive owing to poor genetic potential of available genetic resources for mutton traits.

MAJOR REASONS OF LOW GENETIC IMPROVEMENT

Livestock improvement encompasses genetic improvement of genotypes through breeding and selection to ensure their sustainability. The term "livestock improvement" is used to denote improvement of productivity or economic performance of individual animal (Nimbkar & Ghalsasi, 2012) or flock. Good quality, reliable data on breeds maintained at sheep breeding farms is prerequisite for

formulating appropriate improvement policies. Currently, the accurate data is not available. Further, the minimum time period required for a genetic improvement programme has to be at least 10 to 15 years and such programs require strong institutional support. Closed flocks of small size maintained at sheep breeding farms suffer from inbreeding depression and genetic drift. Inbreeding is usually associated with the appearance of genetic defects and a general decline in vigour and performance (Mandal et al., 2004; & Ceyhan et al., 2011), decrease lamb survival (Lamberson & Thomas, 1984) and deleterious effect on additive genetic variance as well as on phenotypic values (Falconer & McKay, 1996). The amount of genetic improvement in the breeding programme depends on the accuracy of selection, the intensity of selection and the generation interval. However, in small populations there is low genetic variation, reproductive efficiency, intensity and accuracy of selection. In addition to lack of awareness, non-availability of proven sires, small flock size, lack of infrastructure, high mortality is high and non-availability of records are some reasons behind the no genetic progress. In J and K, small flock sizes, large fluctuations in rearing conditions and management between flocks, and over time within a flock, lack of systematic livestock identification, inadequate recording of livestock performances and pedigrees, and constraints related to the subsistence nature of livestock rearing (where monetary profit is not the most important consideration), the accuracy of selection will be much lower, resulting in even lower rates of genetic gain.

Interventions suggested

1. The data management should be digital with cloud bases portal for real time data analysis.
2. Introgression of Fec-B gene in sheep can used to increase litter size and number of lambs born per ewe.
3. Continued improvement of non-descript and improvement along with conservation of purebred stock is highly recommended.
4. However, increasing genetic worth and number of lambs born per ewe per year along is not sufficient for improving production potential of native breeds. Therefore, a multidimensional program should be framed and strictly adopted for augmenting small ruminant production. Therefore, fodder nursery should be established for production and transplantation of improved verities of legumes and herbs. Seed production stations should be developed for self sufficiency in seed availability.
5. Clean drinking water facilities should be provided to livestock.
6. Disease control programs through adaptation of proper and timely dosing and vaccination regimes need to be adopted.
7. Establishment of effective diagnostic centers and identification of effective medicines for treatment requires top priority. Non-conventional feed and fodder resources should be utilized.
8. Housing improvement for livestock keeping in consideration proper drainage and ventilation.
9. Wastelands should be developed and used for fodder production.
10. Extension activities should be strengthened desired information should be provided to the farmers in the form of printed leaflets and mass media. Educating the farmers regarding importance of balanced feeding, disease control and breeding should be a routine practice.
11. Improvement in housing by way of providing proper drainage, ventilation and bedding material particularly during winter (Khan et al., 2013).
12. Development of entrepreneurship among the rural youth should be encouraged. Marketing facility should be developed for livestock and livestock related products.
13. A strong need based research and development support for transfer of technology is highly recommended.

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Role of Nitrogen-Fixing Legume Crops to the Productivity of Agricultural Systems

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INTRODUCTION

Approximately 80% of Earth's atmosphere is nitrogen gas (N_2). Unfortunately, N_2 is unusable by most living organisms. Plants, animals, and microorganisms can die of nitrogen deficiency, surrounded by N_2 they cannot use. All organisms use the ammonia (NH_3) form of nitrogen to manufacture amino acids, proteins, nucleic acids, and other nitrogen-containing components necessary for life. Biological nitrogen fixation (BNF) is the process that changes inert N_2 into biologically useful NH_3. This process is mediated in nature only by N-fixing rhizobia bacteria (*Rhizobiaceae*, *α-Proteobacteria*) (Sorensen & Sessitsch, 2007). Other plants benefit from N-fixing bacteria when the bacteria die and release nitrogen to the environment, or when the bacteria live in close association with the plant. In legumes and a few other plants, the bacteria live in small growths on the roots called nodules. Within these nodules, nitrogen fixation is done by the bacteria, and the NH_3 they produce is absorbed by the plant. Nitrogen fixation by legumes is a partnership between a bacterium and a plant. Legumes are plants that bear their seeds in pods. They differ markedly from grasses, cereals and other non-legume crops because much of the nitrogen they require is produced through fixation of atmospheric nitrogen by bacteria in nodules on their roots. As a result, legumes are rich in protein. World-wide more than 16,000 species of legumes are known, including herbs, shrubs and trees, but only about 200 are cultivated.

BNF can take many forms in nature, including blue-green algae (a bacterium), lichens, and free-living soil bacteria. These types of nitrogen fixation contribute significant quantities of NH_3 to natural ecosystems but not to most cropping systems, with the exception of paddy rice. Their contributions are less than 5 lb of nitrogen per acre per year. However, nitrogen fixation by legumes can be in the range of 25–75 lb of nitrogen per acre per year in a natural ecosystem, and several hundred pounds in a cropping system (Frankow-Lindberg & Dahlin, 2013; Guldan et al., 1996; & Burton, 1972).

Amounts of BNF

In view to understand legume N_2 fixation and N-cycling in a farming system the following terms are essential to know:

Terms used to describe legume N_2 fixation and N-cycling in farming systems

Term	Meaning
N_2 fixation	The reduction of atmospheric nitrogen (N_2) gas to ammonia (NH_3). N fixation in legumes is a biological process in which root nodule bacteria (rhizobia) fix N_2 via the enzyme nitrogenase.
Total crop N fixed	The total contribution of N_2 fixation to legume biomass, including above-ground vegetation and below-ground roots and nodules. In legumes, 30-50% of total crop N is in the below ground portion of the plant.
Crop N balance	The difference between N inputs and N outputs. N inputs are N_2 fixation + fertilizer N (if applied). Outputs are the N in harvested grain or hay/fodder + N lost through volatilization and leaching.
NO_3-N benefit	The extra NO_3-N available after a legume; best described as the difference between soil NO_3-N when the legume was sown and NO_3-N at sowing of the following crop.

Nitrogen fixation by crop legumes has now been estimated in many studies. Average amounts of N fixed range from 60 kg N /ha for lentils to 183 kg N/ha for Faba bean (Table 1).

Table 1: Estimates of N_2 fixation by different legume crops

Crop	Average crop N fixed (kg.N/ha)
Faba bean	183
Ground nut	150
Pigionpea	146
Green gram	112
Cowpea	110
Soybean	92
Mung bean	80
Pea	80
Chickpea	70
Lentils	60

Benefits of Legumes in Crop Rotations

1. Uptake of legume N by following crops

- In the legume-cereal sequence, the legume crop uses most of the N_2 it fixes during the growing season (about 60% BNF out of total N requirement), eliminating the cost of fertilizer N to produce a crop. After harvest, about 20-30% of BNF-N is mineralized from the legume residues in the form of NO_3-N to the succeeding crop, while adding a lot of N (70-80% of BNF-N) to native soil organic matter. Further this cropping sequence reduces gaseous N losses as NO (a potent greenhouse gas) giving environmental benefit.

In the cereal-cereal sequence, fertilizer N is applied to the first cereal crop and no N is released after harvest. In fact, there is a deficit because of the high C:N ratio of the cereal stubbles and eventually a net immobilization occurs and gaseous N losses.

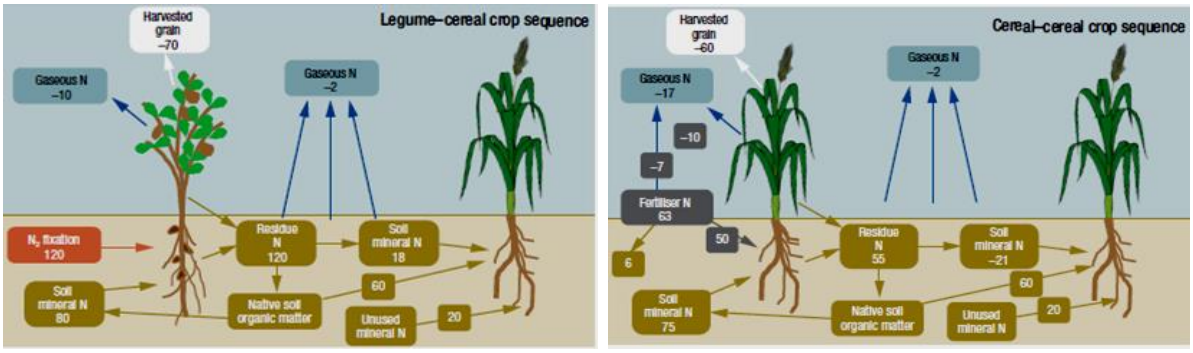

Fig. 1: Contrasting N-cycling in legume-cereal and cereal-cereal crop sequence. The values for N (kg/ha) in the boxes are a combination of experimental data and simulated estimates

- A notable feature of the decomposition and release of N from legume organic material is that, after a period of time, the subsequent rate of mineralization becomes quite slow, regardless of the initial quality of the residues, so that the legume N not mineralized during the first season becomes available only very slowly thereafter (usually <5-10% per year) for successive crops (Fillery, 2001). This suggests that legumes are an efficient short-term source of N (Hesterman et al., 1987, & Harris et al., 1994). Certainly <15% of the N in a following crop appear to be derived from the prior legume. However, there are also situations where legume sources have provided a significant proportion (20~33%) of the next crop's N requirements, as residual N from legumes.
- This ignores the potentially large amounts of below-ground legume N associated with, or derived from, roots and nodules (Rochester et al., 1998; & Khan et al., 2002). Wheat *(Triticum aestivum)* has been reported to utilize between 3-10% of the residual below-ground N from a previous lupin crop (McNeill & Fillery, 2008), or 8% and 15% of the below-ground N of prior faba bean and chickpea crops, respectively (Khan, 2000).
- The below-ground legume N plays a key role in contributing to the soil pool of particulate organic matter (Schwenke et al., 2002) and may be the source between 30-75% of the total mineral N accumulating after legumes (Evans et al., 2003). Thus the below-ground pool of legume N appears to be an important source of N for following crops.

2. Rotational benefits not related to N

2.1. Impacts on soil structure or nutrient and water availability

- There is evidence that legume species such as chickpea, pigeon pea and white lupin *(Lupinus albus)* can mobilize fixed forms of soil phosphorus by the secretion of organic acids such as citrate and malate (and other compounds) from their roots (Hocking, 2001) and influence supply of plant-available phosphorus for subsequent crops (Nuruzzaman et al., 2005).
- Tap-rooted legume species can also assist the roots of following crops to explore a larger soil volume through improvements in soil aggregate structure and organic carbon (Rochester et al., 2001; & Shah et al., 2003), the penetration of soil hardpans, and by providing a continuous network of residual root channels and macro-pores in the subsoil (e.g. Lesturgez et al., 2004).
- Species such as pea use less water than other crops (Merrill et al., 2007). Such carryover of available soil water after legumes has been identified as an important factor contributing to higher yields by following wheat crops (Miller et al., 2002).

2.2. Impacts on soil biology

- Legumes can also influence the populations of specific rhizosphere organisms which may compete, antagonize or suppress pathogens (Kirkegaard et al., 2008). Some legumes appear to reduce the survival of certain species of nematodes.
- Legumes also encourage mycorrhizal associations that assist nutrient uptake, and stimulate the activity of a plethora of soil organisms such as earthworms (Jensen & Hauggaard-Nielsen, 2003; & Lupwayi & Kennedy, 2007).
- Legumes in rotations also result in greater microbial activity and diversity in soils (Lupwayi & Kennedy, 2007).
- Some symbioses also influence the composition of the microbial population in the legume's rhizosphere *via* the release of molecular hydrogen (H_2) as a by-product of symbiotic N_2fixation in legume nodules. About 35% of the energy consumed in the overall nitrogenase activity goes towards H_2production (Hunt & Layzell, 1993). In some legume systems, the rhizobial bacteria (*Bradyrhizobium* sp.) possess a hydrogenase uptake system (uptake hydrogenase, designated Hup+) that is able to recycle almost all of the H_2 evolved and recover most of the energy that might otherwise be lost (Evans et al., 1988) and significantly increase grain yield of a succeeding barley crop by 48% or a succeeding maize *(Zea mays)* crop by 32%.

Conclusions and Future Prospects

While the calculated inputs of fixed N by food legumes and the carryover of fixed N for the benefit of following crops may seem relatively small when compared to the 85 million t N

applied as fertilizer each year, there are a number of environmental and rotational advantages in relying upon N_2 fixation rather than fertilizer N to produce high-quality foods. Strategies are available to improve N_2 fixation beyond what is currently being achieved. Provided that a legume crop is abundantly nodulated and effectively fixing N_2, enormous benefits in terms of crop production and N_2 fixed can be derived from the application of good agronomic principles. But the ability to overcome constraints at the farm level to undertake the applied N_2 fixation research for farmers' benefits, continues to deteriorate rather than improve. Hence, there is a need for some strong policy intervention to redress this trend.

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Importance of Aquaculture in Agriculture

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INTRODUCTION

Aquaculture is the controlled process of rearing, breeding and harvesting of aquatic species, both animals and plants, especially for human consumption, though it is controlled aquatic environments like the oceans, lakes, rivers, ponds, and streams. It's a similar conception to agriculture, but with fish instead of plants or livestock.

All over the world, the demand for seafood is increasing rapidly as the population is increasing. It accounts for more than 50% of the world market for fish or fish products. Today people are more knowledgeable about the importance of aquaculture like seafood and its nutrias value. It provides an efficient means of protein production.

economic importance of aquaculture

- Source of food - the importance of aquaculture as a source of food is indescribable. Fish and other seafood are great sources of protein for Humans. They also have to a greater extent nutritional merit.
- source of fuel - fish or aqua-cultural product is important for use as fuel for a long time. From the early time, it was not commercially but it is using today as commercial purpose as it is sustainable and eco-friendly.
- Job opportunities- aquaculture is creating an increasing number of job opportunities. Potential jobs in the market as it creates both new products for a market and creates job opportunities for the laborers are needed to keep up the pools and harvest the organisms grown properly.

Environmental importance of aquaculture

- Pollution control-This system allows for a buffer state that defends the rest of the sea from contamination from the land, specifically from actions that agitate the sea bed and raise dust.

- Biodiversity Conservation- aquacultures show the way of cultivation of various fishes whatever it cultivated or whatever it wild. Artificial aquacultures help us to defend biodiversity by reducing the fishing activities on the wild stock in their ecosystems.

Social importance of aquaculture

- User conflicts- aquaculture development can generate conflicts between competing users and uses of land and water resources.
- if aquaculture is planned as community-based development of a highly integrated, local operation, then employment opportunities and the potential for positive community impacts increase dramatically.
- Successful aquaculture, like any other business tends to have both positive and negative knock on effects. Fish farming usually leads to an increase in income per unit area of land, and therefore drives up the price or rental value of land.

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Karnah Sheep – A Review

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INTRODUCTION

Karnah is a registered, native and distinct sheep breed of Kashmir distributed to Karnah Tehsil of Kupwara district. The breed is known for mutton and course wool production. The breed has been crossed with Kashmir Merino for improving fine wool production. The coat colour of animals is usually white. However, black coat colour is also common. The breed is least studied and scanty information is available about the breed. The present article is written to collect published information about the breed.

Growth traits: Growth is defined as an increase in tissues and organs of the animals per unit time (Tariq et al., 2011). It is measured as body weight at a specific age. Growth traits are indicators of adaptability of an animal to the existing environmental conditions (Lalit et al., 2016). The growth traits ok Karnah sheep are presented in Table 1.

Table 1: Growth traits of Karnah sheep

Sex	Trait				References
	BW (kg)	(kg)	6MW (kg)	YW (kg)	
Male	2.8±0.02	7.6 ± 0.06	21.1±0.56	21.3±0.79	Ganai et al. (2009)
Female	2.7 ± 0.02	7.8 ± 0.07	21.4±0.39	20.4±0023	
Male	2.78±0.02	7.55±0.06	21.07±0.79	21.280.79	Gupta et al. (2007)
Female	2.65±0.02	7.84±0.07	21.36±0.39	20.43±0.23	

BW = Birth weight, WW = Weaning weight, 6MW = Six months weight, YW =1 year

Biometric traits: Body measurements of animals provide information about its morphological structure and physiological status in addition are used for establishing breed standards and developing suitable selection criteria (Rather et al., 2021). The average biometrical traits of Karnah are presented in Table 2.

Table 2: Biometrical traits of Karnah sheep

Sex	Age	Body length	Chest girth	Height at withers	**References**
Male	Birth	28.2 ±2.90	28.6±0.40	30.5±0.30	Ganai et al. (2009) Gupta et al. (2007)
	3 Months	43.4±0.28	48.2±0.28	38.0±0.29	
	Adult	45.1±0.36	72.9±1.11	45.0±80.00	
Female	Birth	27.2±0.22	28.6±0.36	29.2±0.26	
	3 Months	39.7±0.42	45.1±0.36	36.00±0.31	
	Adult	61.7±0.34	68.5±0.45	58.3±0.27	

Wool traits: Ganai et al. (2009) reported average wool production at 1 year, 2 year age and in adult stage was 529.39±23.85, 612.74±14.41 and 710.0±47.26 gm, respectively in Karnah sheep. However, Arora and Garg (1998) reported wool yield of 1 to 1.5 kg of wool per animal annually. Average staple length of 5.11±0.46 (males), 5.39±0.15 (females) was reported by Ganai et al. (2009) in Karnah sheep. The wool of Karnah sheep is course to medium fine with fibre diameter of 28 to 34µ (Anonymous, 2021).

Reproduction traits: Karnah is a seasonal breed. The age at first mating of 1.5 to 2 years was reported by Ganai et al. (2009). The average litter size of 1.04 and the age at first lambing varied from 2 to 2.5 years in Karnah sheep Ganai et al. (2009). The reproduction traits of Karnah sheep are reflected in Table 3.

Table 3: Reproduction traits of Karnah sheep

Trait	Average	**References**
Age at first mating (Males)	20.00±115(Months)	Ganai et al. (2009) Gupta et al. (2007)
Age at first estrus	19.0±1.12(Months)	
Estrous cycle duration	20.0±1.20(days)	
Estrous duration	24.0±1.50(Hours)	
Age at first lambing	25.04±0.42(Months)	
Inter-lambing period	365 (days)	
Litter size	1.04	
Life time number of matings	6-7 times	

General Information: The general information about Karnah sheep is presented in Table 4. The breed is endangered owing to indiscriminate crossbreeding with Kashmir Merino sheep. There exists no conservation policy to conserve this precious germplasm.

Table 4: General information

Distribution	Karnah tehsil
Horns Male Female	 Large curved Polled
Wool	White
Breeding	Cross breeding with Kashmir Merino
Status	Endangered

Recommendation: The breed should be conserved and a nucleus breeding farm should be established in its ecological niche after systemic survey. Incentives and subsidies on feed and fodders should be provided to the farmers for rearing the breed.

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Reduction of Fruit Ripening in Mangoes

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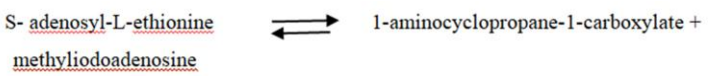
INTRODUCTION

In the prevailing pandemic situation we are able to see farmers getting losses not due to inability to produce crops but due to inability of marketing. Fruits in particular have a lesser shelf life period within which they should be sold or dumped as waste. Mangoes to be noted are highly nutritious fruits containing a huge amount of VITAMIN –A. It is also rich in vitamin C and is filled with polyphenols that acts as antioxidants. They also have a huge industrial value, since it is being processed into various products such as juices, pickles, candies etc. Now a days requirement of these fresh mangoes are in demand just because of the export issues we face during these pandemic situations. This article deals with an idea to increase the shelf life of mangoes.

PRODUCTION (2020-21)	PRODUCTIVITY (2020-21)
21.12 MT	8.5 MT

ETHYLENE PRODUCTION AND MANGO RIPENING:

We know that most fruits ripen due to the production of ethylene, a gaseous hormone produced by plant tissues. The expression of 1-aminocyclopropane-1-carboxylate (ACC) synthase and ACC oxidase are responsible for ethylene production.



ACC synthase is an enzyme belonging to the family lyases. This enzyme that produces ethylene is the key component for mango ripening.

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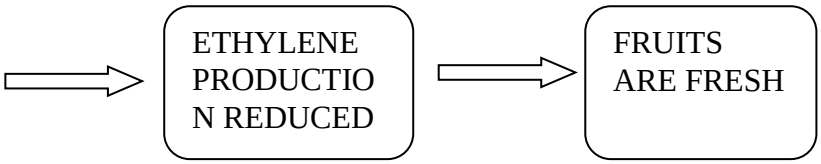

GENE SEQUENCING AND SILENCING:

It is first necessary to sequence the genes of this crop. We have to analyze and find out the gene responsible for ACC synthase. There are several procedures to either reduce the expression of that particular gene or to completely remove it. One of the famous techniques used is gene silencing. Gene silencing refers to the way of controlling the expression of gene. There are procedures to be followed to silence a gene. By silencing this particular gene it is possible to reduce the ethylene production to the maximum and so the ripening too.

CONCLUSION

Mango being an important fruit crop with a high yield and good market value it is necessary to preserve it still it reaches the end desire end. This idea of controlling the ethylene production in fruits can be implemented thus helping the farmers to increase the shelf life and increasing the overall economic condition of the nation.

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Rabies/Lyssa/Rage/Hydrophobia: A Deadly Disease in Animals

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INTRODUCTION

Rabies is caused by *Lyssavirus*/Rhabdoviridae, which is a true neurotropic virus. Rabies is a viral non-suppurative encephalomyelitis affecting warm-blooded animals including humans (zoonotic) causes 100% mortality. The most important mode of transmission of this infection is through the bite of rabid animal. Contamination of skin wounds with infected saliva (rich in virus) of rabid animals (dog, fox, mongoose, vampire bats, raccoons etc.) is speculated to be the most potential source of infection. Although rare cases of in-utero transmission, milk, licking, inhalation (mines with bats) etc. are also reported. Stray dogs are main reservoir/carrier of rabies in India; Mongoose are wild reservoirs in India; Vampire bats are main reservoir in United States. Bats are asymptomatic carriers (as virus multiply in adipose tissue). Incubation period of this disease ranges from 1 week to 1 year, depending upon the virulence and quantity of virus in saliva, distance between the site of bite and CNS etc. Bites near to head than extremities are more likely to lead to rabies and more acute death in affected hosts.

Pathogenesis of infection

2. Centripetal spread

Replication of virus in myocytes/muscles cells and release into extracellular space (transmission of virus is through axons not through viremia)

⬇

Virus binds with acetylcholine receptors in motor end plates

⬇

Virus enters into the spinal cord/ventral horns at the rate of 3-4 mm/hour and undergo replication

⬇

Finally enters into brain stem, cerebral cortex and hippocampus leading to destruction of neurons

2. **Centrifugal spread** of virus occurs from CNS to other tissues like salivary glands (main site), tonsils, cornea etc.

Clinical symptoms

First sign in rabid animals is always change in behaviour.

1. **In dogs**

- **Dumb or paralytic form**

✓ Peculiar starring expression/vacant look
✓ Profuse salivation and inability to swallow
✓ Dropping of lower jaw causing inability to drink water due to paralysis of facial and laryngeal muscles called hydrophobia

- **Furious form**

✓ Aggressive, excited and violent anger/rages with red eyes
✓ Bite the inanimate or moving objects
✓ Clamping of jaws/chewing noisily with excessive foamy salivation
✓ Rabid wild animals (foxes, wolves etc.) or dogs attack humans and domestic animals

2. **Other animals**

- **Cattle:** bellowing (making deep loud cry)—characteristic feature, frequent micturition, off feed, stop of milk production
- **Horses:** rolling like colic

Pathological changes in rabies

1. **No gross lesions** (except congestion of meninges sometimes)
2. **Microscopic lesions**

- Diffuse encephalomyelitis with perivascular cuffing with lymphocytes in brain stem, hippocampus, Gasserian ganglion (mainly)
- Small nodules formed by the collections of proliferating microglial cells encroaching and replacing the affected neurons called Babes nodules (appears in Gasserian/trigeminal ganglion most earliest) followed by neuronophagia
- Intra-cytoplasmic inclusions in the neurons called Negri bodies (in hippocampus in dog, Purkinje cells of cerebellum in cattle). Negri bodies are 2-8 micro meter in diameter and have a distinct limiting membrane encircled by a narrow clear halo. Lyssa bodies are looking like Negri bodies but don't have any limiting membrane and are present in non-rabid animals
- Negri bodies are not well demonstrated with H& E staining technique but Mann' stain, Schleif staining methods can be used
- Seller's stain can be best used to demonstrate the Negri bodies in impression smear

Diagnosis

- Animal with abnormal behaviour must be kept in isolation for 10 days, if dies the laboratory examination must be done for confirmation
- IFAT- INDIRECT FLUORECENT ANTIBODY TEST (Gold standard OIE recommended test)
- Histological investigation of Negri bodies
- Habel's/Swiss mouse inoculation test
- Peroxidae-antiperoxidae staining technique

Fig. 1. Congestion in the meninges of a cattle died due to rabies

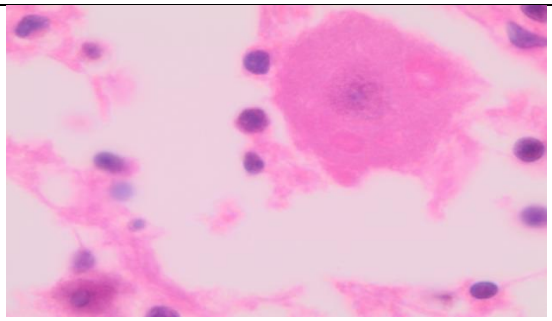

Fig. 2. Eosinophilic intracytoplasmic inclusions in the neuron on histopathology. H& E X100

Prevention and control

- Mass vaccination of stray dogs and wild animals (using vaccine baits)
- Population control of stray animals
- Education and awareness among people regarding rabies
- Veterinarians can play important role to control the rabies through animal birth control and mass vaccination in their respective areas

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The Role of Zinc in Plant Nutrition

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INTRODUCTION

When there is a deficiency of a particular element in the land, then it is definitely impossible to get a good crop without removing the deficiency of that element. Plants require many nutrients to grow and flourish. If the nutrients required by the plants are not supplied properly, then the plants cannot develop properly and yield is not available.

Along with the major nutrients, deficiency of important nutrients like zinc is being experienced in most parts of the country. In such a situation, it may not be possible to get a good yield with the use of nitrogen, phosphorus and potash only. A significant increase in crop yield is achieved when zinc is used in combination with key nutrients in zinc deficient fields.

The role of zinc in plant nutrition:-Zinc is a part of many metal enzymes, besides zinc plays a role in activating many enzymes, zinc helps in protein synthesis. In the absence of this element, protein synthesis cannot take place. Zinc also affects the utilization of carbohydrates in plants. It helps in the formation of chlorophyll when combined with iron and manganese.

Symptoms of Zinc Deficiency:-The symptoms of zinc deficiency are clearly visible in plants. Due to its low or excessive deficiency, the following symptoms are manifested.

- due to inhibition of plant growth, dwarfism (dwarf)
- chlorotic yellowing of leaves (chlorosis)
- thickening, thickening or distorting of leaves (mottleaf)
- tissues in the chlorotic area on the leaves Die off (necrosis)
- shortening of stem and shriveling and sweeping of leaves (rosetti)
- Small, abnormal, deformed and folded leaves (little leaf)
- Early fall of leaves, flower and fruit deformity (hypertrophy)
- Adverse effect on seed formation Excessive reduction of production.

Apart from all this, sometimes the symptoms of zinc deficiency are not visible but there is a direct adverse effect on the production.

Detection of zinc deficiency in crops:

Wheat:-Symptoms of zinc deficiency in wheat appear shortly before the onset of buds, the central part of the older leaves turns yellow and the tissue at the sites of these spots dies. As a result, the affected leaves bend down from the middle. First, the symptoms of deficiency appear on the third and fourth leaves and later the new leaves are affected, which reduces the production.

Maize:-Due to the deficiency of zinc in maize, light yellow streaks occur in the middle of the veins of the middle fully grown leaves, which later acquires a white color. The newly emerged leaves are usually light yellow or white in color, so this disease is called white bud disease. **Mustard:-**Due to zinc deficiency, brown and beige colored spots appear in young leaves which later turn white. The stem becomes very short and the leaves become tufted at the top is a symptom of severe deficiency.

Gram:-Small and yellow appearance of leaves is the main symptom of zinc deficiency. Falling of flowers and shortening of pods are also its special symptoms.

Paddy:-The disease which occurs in paddy due to deficiency of zinc is called Khaira disease. Due to this disease, after 15-25 days of transplanting, the third and fourth leaves of the plants first show signs of chlorosis, after that small spots of brownish golden color appear on them, which later meet each other on all the leaves. gets spread. As a result, the entire plant appears reddish brown and eventually the leaves die.

Potato:-Irregular spots of brown gold color are formed on the stems and leaves. Plant growth stops. Leaves become distorted, clump and curl upwards with symptoms of cyanosis. Due to the appearance of old leaves like fern leaves, it is called fernleaf disease. Different varieties of potatoes produce different symptoms. **Onion:-**Due to zinc deficiency, the plant becomes dwarf, the tip of the leaf becomes yellow striped and twisted. Yellowing of leaves is the main symptom of zinc deficiency.

Tomato:-Its symptoms appear quickly in cold. The initial growth is very slow, the leaves are thick, abnormal and show signs of colorlessness. Leaves turn downwards and brownish yellow spot on it and petiole becomes like hook.

Vegetables:-Due to zinc deficiency in vegetables, firstly the cyanosis between the veins of the leaves, the leaves become abnormally deformed and twisted upwards. Flowers fall early and fruit holding capacity and fruit quality are affected.

Mango:-The disease caused due to deficiency of zinc in mango is called Little Leaf. In this, the leaves are deformed, abnormal and take the form of a bunch in the top. Premature shedding of flowers and fruits Copper colored spots on older leaves. Being is a symptom of it.

How to use Zinc for the diagnosis of the above diseases

1. Mixing in soil:-In normal land, application of Zinc Sulphate (21 percent) is suitable at the rate of 5-10 kg per acre, but in alkaline soil this amount is found to be 10-20 kg per acre. Entire amount of zinc should be applied along with other fertilizers at the time of planting in paddy and at the time of sowing in other crops.

2. Foliar spraying:-For some reason, zinc was not used in the field and if zinc deficiency is experienced in the standing crop, then for foliar spray of zinc sulphate, 2 kg zinc sulphate (21 percent) and 1 kg slaked chives should be used. It should be sprayed on the leaves by dissolving it in 200 liters of water. Next spraying must be done at an interval of 10 days.

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Art of Silk Cocoon Crafting - Entrepreneurial Opportunities for Rural Women

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INTRODUCTION

Sericulture is an agro-based industry, the final product of which is the '*silk*'. India holds a unique position in production of all commercially exploited silks of Mulberry (*Bombyx mori* L), Eri (*Samia ricini* B), Muga (*Antheraea assama* Ww), Tropical Tasar (*Antheraea mylitta* D) and Temperate Tasar (*Antheraea proylei* J). India ranks second, next to China in the production of silk. Sericulture involves cultivation of the host plant and harvesting the leaves for feeding the silkworm; the rearing of silkworm for production of cocoons; reeling and spinning of cocoon to produce raw silk and processing it to produce the finished product, '*silk fabric'*. Sericulture is such an activity where a number of by-products called '*sericulture waste*' are generated. Various sericulture wastes are converted into useful products which are used intensively not only in various research line but also in the manufacture of products of day to day need. All these by-products have economic value if it is processed properly. It is claimed that in sericulture nothing is a waste. The utilisation of these by-products plays an important role in the economy of the silk industry. Apart from utilisation of the silk waste, recent advancement has also been made for purposeful use of host plant products, larvae, excreta, pupae, pierced/ cut cocoons, etc. which have the potential to convert these waste into useful by-products of commercial value, generate additional income to the farmer and also employment generation.

Cocoon handicraft

A major concern of the silk industry is not only in the production of good quality silk which after processing convert it into silk fabric, but also to utilize the silk waste products obtain during the reeling process into a value-added product.

Utilisation of the sericulture by-product so far has not met with the tremendous scope and importance among the people. Besides production of silk, by-products can be put in a better way for turning the silk industry into a more profitable and economically a viable unit. Several aspects on use of by-products need to be explored as early as possible.

The purposeful use of by-product has enhanced the value of sericulture activity by 10-25%. Among the by-products, the cocoon craft is the eye catching art in the silk industry which will give wonderful scope to develop human skills in addition to generate self employment and revenue by converting these waste cocoon into decorative fancy items. Utilisation of pierced cocoon, cut cocoon, defective cocoons is steadily increasing in handicraft industries and gaining much popularity. These waste cocoons are cut, cleaned, and dyed to make beautiful items like garlands, flower vases, dolls, show piece, pen stands, jewellery, wall hangings, decorative door and window strings, wall plates, crafts clocks, greeting cards, bouquets etc.

Fig. 1: Earrings

Fig. 2: Wall Hanging

Fig. 3: Wall hanging

Fig. 4: Wall Hanging Buddha

Fig. 5: Garland

Fig. 6: Wall Hanging

Fig. 7: Cut Flowers

Fig. 8: Show piece

Fig. 9: Flower vase

The cocoon crafted stuffs maintain its lustre for years. These handicrafts can be used at homes and work places to add its aesthetic and artistic look. Cocoon crafting can be taken as a commercial activity particularly by women folks and in return obtain good economic returns with their creative skills. If such activity of cocoon craftwork is adopted commercially, it will attract many cocoon growers, buyers and local people towards the upliftment of this craft business (occupation) thereby boosting up their revenue returns and value addition in sericulture through handicraft market.

These decorative items prepared from waste cocoons are gaining popularity in India in the recent times. Besides, considering the increasing demand from different states of India, Government organizations, NGOs, progressive farmers and new entrants in sericulture, several short duration training courses on cocoon handicrafts are also organized by Central Sericultural Research & Training Institute, Mysore.

Proper use of these by-products can be converted into industrial and market oriented materials. These handicrafts (craftworks) are generally sold in handicrafts emporium at net profit of about 50% and now it has become a source of income for many rural families for their livelihood.

The use of these cocoon craft so far has not been popular among the silkworm rearers of North East India. The tribal as well as general silkworm rearers of North Eastern region of India consume pupa in different forms. They consider the silkworm pupa as delicacy and the cocoon is more or less a by-product.

The majority of the farmers belong to economically poorer sections and unaware about the purposeful and potentiality of the cocoon handicraft. The cocoons produced were either used for their own silk purpose or sold to the reelers and the value addition through by-products was never thought of.

The useful conversion of by-products through indigenously available processing techniques will bring additional income leading to socio economic upliftment of the rearers. The cocoon art craft certainly boosts up the Sericulture. The Research and Development institutions, Sericulture departments, NGOs, policy makers should work on awareness and to popularize the concept of value addition with fitting trainings, projects and global marketing outlets for effective by-product utilization of silk cocoon. For new aspirants in order to start with the silk cocoon handicraft, can start with very limited inputs with the following requirements listed below:

Materials required for cocoon crafting:

Basic raw materials: The basic raw materials (cut/pierced cocoons) can be procured from any government or private grainages. The unused or rejected (dead/double) cocoons can also be used as a substitute raw material to earn more returns.

Other miscellaneous materials: The items required are mostly based on the handicraft to be designed such as, scissors, zig-zag scissors, drawing sheets, coloured thread, cotton thread, blade, drawing brush, coloured dye, cardboard, needles, fabric glue, craft paper, velvet paper, adhesive tape, colour tape, stapler, plastic ornamental material, fabric paint, soft binding wire, water colour, colourful beads, dyeing vessel, etc. are used during cocoon craft preparation.

CONCLUSION

The useful conversion of by-products brings additional income lead to socio-economic advantage of rural people. The waste cocoon though having less commercial value can generate good returns if it is utilized for preparation of cocoon handicrafts skilfully. Rural women folk can take up the activity and earn more as an aid to their livelihood. Cocoon crafting is a self-employment with minimum input but with considerable profit if the activity is taken up with enthusiastic and skilfully to give a creative touch.

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Role of PGPR in Sustainable Agriculture

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INTRODUCTION

Climate change is the burning threat to world's agricultural sustainability in the 21st century (IPCC). Drastic changes in various climatic factors (precipitation, temperature, light, etc.) can tremendously reduce the crop yields globally. India's food grain production is estimated to rise to 2.66 percent to new record of 305.43 million tonnes in the current crop year 2020-2021. Wheat production is estimated to rise to a record 109.24 MT in 2020-2021 from 107.86 MT in previous year. While rice production is pegged at a record 121.46 MT in 2020-2021 crop year as against 118.87 MT in the previous year. The improvement in crop yields under unfavourable conditions by conventional or non-conventional methods pose certain limitations in terms of ethical issues and time requirements. Among abiotic stress drought and extreme temperature are commonly faced by cereal crops (Wheat, Rice and Maize) specially in North India. Drought stress is one of the major agricultural problems reducing crop yield in arid and semiarid regions of the world. Changes in mean global air temperature and precipitation patterns are leading to longer drought periods and more extremely dry years, and more severe drought conditions will hinder food production in some countries. Drought stress tolerance is often a complex phenomenon involving clusters of gene networks. Although many of the networks are resolved by researchers, but still a large gap remains. Therefore, alternative eco-friendly approaches are much more appreciable at this time. One such strategy could be the use of stress-resistant plant growth promoting bacteria (PGPB) with critical roles in enhancing plant growth performance under stressed environments. At present, strategies to increase the ability of plants to tolerate drought stress involve the use of water-saving irrigation, traditional breeding, and genetic engineering of drought-tolerant transgenic plants.

Unfortunately, these methods are highly technical and labour-intensive, and thus difficult to apply in practice. One alternative for growing plants under dry conditions is the use of plant growth promoting rhizobacteria (PGPR), as the soil is a natural habitat of various micro-organisms, among them the bacterial species occupy the pre-dominant role. There are certain micro-organisms which can convert this elemental nitrogen to ammonia and make it available to plants. Among symbiotic nitrogen fixers like Rhizobium and free-living nitrogen fixers like Acetobacter sp. are obligatory aerobic, nitrogen-fixing bacteria that are known for producing acid as a result of metabolic processes. Acetobacter diazotrophicus is also a plant endophyte and has been said to be capable of excreting about half of its fixed nitrogen in a form that plants can use and associated nitrogen fixers like Azospirillium, they play a very important role in maintaining the crop productivity and soil fertility. The soil around the roots is called as rhizosphere, which plays an important role. This is a zone where lots of micro-organisms help the overall productivity and plant health. Some of rhizoshere organisms effect the plant growth favourably and these are known as PGPRs (Plant Growth Promoting Rhizobacteria). PGPRs play a very important role in maintaining the soil health and sustainability. Few species of PGPRs are Rhizobium, Azetobacter, Azospirilluim, Enterobacter, Pseudomonas, Bacillus etc. The beneficial effects of PGPRs are like production of growth promoting substances such as IAA, Gibberellins, Cytokinin's etc; the production of siderophores, nitrogen fixation, enhance in total chlorophyll content, root elongation, increase in production of enzymes, antioxidants, cellular osmolytes and ACC Deaminase-Producing PGPR. The enzyme ACC deaminase catalyses the cleavage of 1-aminocyclopropane-1-carboxylate, an intermediate precursor of ethylene in higher plants, to produce α-ketobutyrate and ammonia. A proper amount of ethylene derived from the existing pool of ACC, or so called the small peak of ethylene in the biphasic ethylene response model described by Glick et al., (2007) and Pierik et al., (2006) is thought to be useful to plants in activating plant defensive responses to stress stimuli (e.g., temperature extremes, drought or flooding, insect pest damages, phytopathogens, and mechanical wounding). Many PGPR have been shown to alleviate drought stress effects in plants by reducing plant ethylene levels that are usually increased by unfavourable conditions (Dung Trinh et al., 2021).

The role of PGPRs in Drought Stress

In soil mineralization and nutrient recovery, the presence of a wide variety of insects, ants, termites, earthworms and, most importantly, microorganisms participate. Root-associated rhizobacteria are primarily responsible for synthesizing the many biomolecules that enhance the quality of soils. It stimulates plant growth as a result of nitrogen fixation, phytohormone production, mineral availability enhanced, as well as phytoremediation. The increased phosphate level available to plants is due to the P solubilization process that the PGPRs possess. PGPRs are also known to produce different volatile compounds and metabolites which improve the health of plants and soils.

These beneficial PGPRs colonize the rhizoshere of the plant and promote growth of plants through direct and or indirect mechanisms. The possible explanation for the mechanism of plant drought tolerance induced by rhizobacteria include: Production of phyto hormones like ABA, gibberellic acid, cytokinin's, IAA (Indole Acetic Acid), ACC deaminase to reduce the level of ethylene in the roots,induced systemic resistance (ISR) by bacterial compound. The rhizobacteria assemblages of many agricultural crops have been studied, and the use of PGPR holds promise for plant growth promotion and alleviation of plant drought stress. However, the drought-tolerant bacteria associated with crop species which are naturally adapted to drought, such as wheat, have not been explored.

Different beneficial mechanisms of PGPR

1. **Mineral solubilization by soil microbes**: The phosphate solubilizing bacteria (PSB) solubilize Ca, Fe, and Al inorganic soil phosphates by producing siderophores, many acids (organic), hydroxyl and carboxyl groups, and chelating them to the bound phosphates and calcium available. Potassium solubilizing bacteria (KSB) play an important role in K solubilization by solventing the fixed source of potassium from different minerals. This class of soils microbes mainly includes *Pseudomonas sp.*, *Bacillus circulans*, and *B. mucilaginosus*.

2. Biological nitrogen fixation: Nitrogen fixation is one of the most beneficial processes that rhizobacteria conduct. Rhizobium is able to convert gaseous nitrogen (N_2) to ammonia (NH_3) through nitrogen fixation, making it a nutrient accessible to the host plant that can sustain and promote the growth of plants. Legumes are popular nitrogen-fixing crops and have been used in crop rotation for centuries to preserve soil quality.

3. Siderophore production: The concentrated ionic form in the oxidized state of iron (Fe^{3+}) is capable of forming insoluble oxyhydroxides and hydroxides, contributing to unavailability to plants and microbes, while Fe^{2+} ionic phase with low pH is easily accessible and is more readily absorbed by plants. The iron absorption by bacteria and fungi is due to the presence of siderophores, which have iron chelate specificity and affinity.

4. PGPR as biocontrol agents: PGPR produces substances which protect against various diseases as well as PGPR may protect plants from pathogens by direct antagonistic interactions between the biocontrol agent and the pathogen, and by induction of host resistance. Disease is suppressed by systemic resistance caused by the synthesis of antifungal metabolites. Genetically engineered *Pseudomonas* biocontrol strains have been used to increase plant growth and improve the resilience of agricultural crops to diseases.

5. Plant growth regulator production: Such plant growth regulators also called exogenous plant hormones that are used to control plant growth and are essential steps to improve agricultural production. This is characterized as micro-organisms capable of producing or altering growth regulatory concentrations such as IAA, GA, cytokinins, and ethylene. Projected mechanism is the production of phytohormones (plant hormones), such as auxins, cytokinins, and GA.

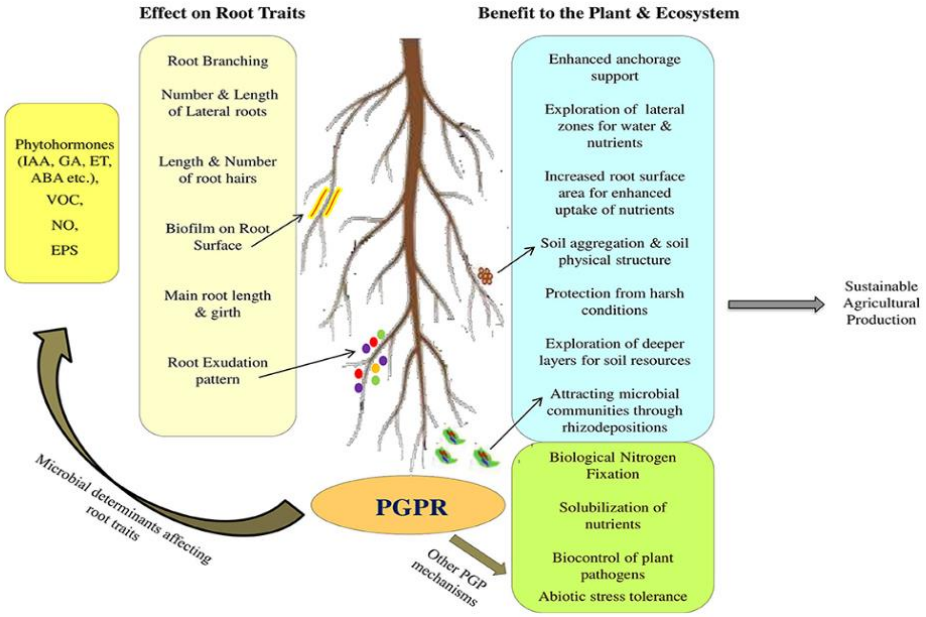

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Fig.1: Various roles of beneficial PGPR in sustainable Agriculture

Fig. 2: A close view of PGPR present on the root nodules of a desert plant

CONCLUSION

To replace chemical pesticides with the system of a bio pesticide should be more effective and economical. It has become apparent that PGPR strains employ several mechanisms to promote plant growth, although studies should be focused on the relative contribution of each mechanism responsible for effective plant growth promotion. PGPR are excellent model systems which can provide the biotechnologist with novel genetic constituents and bioactive chemicals having diverse uses in agriculture and environmental sustainability. Current and future progress in our understanding of PGPR diversity, colonization ability, mechanisms of action, formulation, and application could facilitate their development as reliable components in the management of sustainable agricultural systems.

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- Fish Genetics & Breeding
- Fish Processing & Technology
- Agricultural Physics
- Agricultural Entomology
- Food Science & Nutrition
- Agronomy
- Home Science
- Soil Sciences
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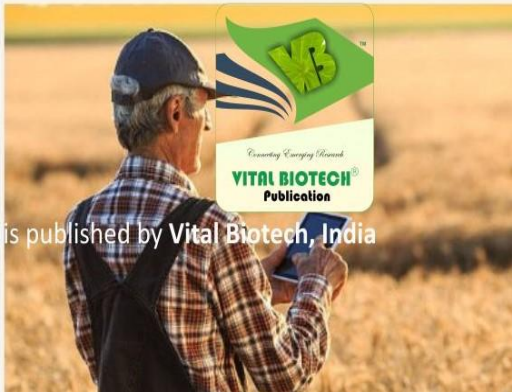

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