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Vertical Farming

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INTRODUCTION

In 1915, Gilbert Ellis Bailey coined the term "Vertical farming" and wrote a book titled "Vertical Farming". In the early 1930s, William Frederick Gerick pioneered hydroponics at the University of California at Berkley. In the 1980s, Ake Olsson a Swedish ecological farmers, invented a spiral-shaped rail system for growing plants and suggested vertical farming as a means for producing vegetables in cities. Using advanced greenhouse technology such as hydroponics and aeroponics, the vertical farm could theoretically produce fish, poultry, fruit and vegetables (Despommier, 2010). His concept was to grow the food in urban areas itself utilizing less distance and saving the time in bringing the food produced in rural areas to the cities. He intended in growing food within urban environments and thus have fresher foods available faster and at lowercosts.

Why vertical farming?

Vertical farming could enable food production in an efficient and sustainable manner, save water and energy, enhance the economy, reduce pollution, provide new employment opportunities, restore ecosystems, and provide access to healthy food. In a controlled environment, crops will be less subject to the infestation, the nutrient cycle, crop rotation, polluted water runoff, pesticides and dust (Touliatos *et al*., 2016).

Vertical farms also utilize advanced technologies and intensive farming methods that can exponentially increase production. Researchers have been optimizing indoor farming by calibrating, tuning and adjusting a wide-range of variables including light intensity, light color, spacetemperature, crop androot, CO2 contents, soil, water, and air humidity (Padmavathy *et al*., 2016). In addition, vertical farming provides an opportunity to support the local economy. Abandoned urban buildings can be converted into vertical farms to provide healthy food in neighborhoods where fresh produce is scarce.

World Scenario

Vertical farming involves growing crops vertically in controlled atmosphere using technology like LEDlighting, heating, ventilation andair-conditioning(HVAC) systems,

sensors and smart software, Internet of Things (IOT), drones, mobile apps to maintain total control over the environment. Food crops can be cultivated easily in urban areas by planting in vertically stacked layers in order to save space and use minimal energy and water for irrigation. Sparks and Stwalley, 2018 tested the Nutrient film technique hydroponics system was by growing lettuce plants and monitoring energy use throughout the growth period..

Various experiments are being done about vertical farming all over world. It has already been introduced in the US and Europe, Spain, Japan and Singapore. Several tech-enabled verticalfarmslike Aerofarmsand Green Senseinthe USA, Deliciousin The Netherlands, Sharp's strawberry farm in Dubai, Spread, Toshiba and over 100-plus vertical farms in Japan, Packet GreensofSingapore,theEUfunded INFARMinBerlinare provenexamplesofsuccessfulvertical farming. INFARM is now operating more than 50 farms across Berlin in supermarket aisles, restaurant kitchens and distribution warehouses. The National Aeronautics and Space Administration (NASA) researchers have seen hydroponics as a suitable method for growing food in outer space. They have been successful in producing vegetables such as onions, lettuce, and radishes. In Columbia, Association for Vertical Farming is working on its sustainability.

Categories of vertical farming systems

Vertical Farming systems can be broadly divided into two categories those comprising multiple levels of traditional horizontal growing platforms and grown on a vertical surface. Horizontal growing system are stacked horizontal systems and multi- floor towers, Balconies. Vertical growth surfaces are green walls and cylindrical growth units.

General Structure of Vertical Farming

The vertical farm is planned to be totally using artificial light or both artificial and natural light should be taken into account. The same issues need to be considered in designing the facility. There are two options available LED (light emitting diode) or HPS (high-pressure sodium). When choosing the crops to grow considering which plants can be better bred indoors. Because of limitations imposed by height, plants that grow on trees such as bananas, olives, avocados, and nuts are hard to grow inside. But, there is another chance to grow tree crops and that is to grow them in an outer area as much as there is space provided. This way, more than three dozen types of vegetables can be chosen to grow inside the building hydroponically (Ankri, 2010). The most common products now produced in vertical farms are lettuce, tomato, chinese cabbage,eggplant, green onion/chives, kale spinach andcucumber.

SYSTEMS OF VERTICAL FARMING

1. Hydroponics

"Hydroponics" is the growing of plants in a liquid nutrient solution with or without the use of artificial media. Commonly used mediums include expanded clay, coir, perlite, vermiculite, brick shards, polystyrene packing peanuts and wood fiber.

Hydroponics has been recognized as a viable method of producing vegetables (tomatoes, lettuce, cucumbers and peppers) as well as ornamental crops such as herbs, roses, freesia and foliage plants.

The predominant growing system used in vertical farms, hydroponics involves growing plants in nutrient solutions that are free of soil. The plant roots are submerged in the nutrient solution, which is frequently monitored and circulated for maintaining correct chemical composition. This method results in more uniform and better yields the optimum combination of nutrients can be provided to all plants. It also provides less labour intensive way to manage larger areas of production. It is a cleaner process that no animal excreta are used. Easier way to control nutrient level and pH balance. In 1950 commercial farms are started at America, Europe, Asia, Africa, Japan most successfully practiced in Israel.

Liquid systems have no supporting medium for the plant roots; whereas, aggregate systems have a solid medium of support. Hydroponic systems are further categorized as open (once the nutrient solution is delivered to the plant roots, it is not reused) or closed (surplus solution is recovered, replenished, and recycled).

Liquid Hydroponic / Nutrient Film Technique

Plants are placed in a polyethylene tube that has slits cut in the plastic for the roots to be inserted. Nutrient solution is pumped through this tube.

Floating Hydroponics

Plants are grown on a floating raft of expanded plastic.

Aggregate Hydroponics

Rockwool Culture: It is the most widely used medium in hydroponics. Rockwool is ground-up basalt rock that is heated then spun into threads making wool. It is very light and is often sold in cubes. Rockwool can hold water and retain sufficient air space (at least 18 percent) to promote optimum root growth. Plants are established on small rockwool slabs positioned in channels containing recycled nutrient solution.

These system are further categorized into two:

- Passive systems use a wick and growing media with very high capillary action. This allows water to be drawn to the plant roots. The Wick System is by far the simplest type of hydroponic system
- Active systems work by actively passing a nutrient solution over your plants roots.

2. Aeroponics

The Aeroponic System is probably the most high-tech type of hydroponic gardening. A timer controls the nutrient pump. The aeroponic system needs a short cycle timer that runs the pump for a few seconds every couple of minutes. In aeroponics, there is no growing medium and hence, no containers for growing crops. In this system, mist or nutrient solutions are used instead of water. As the plants are tied

to a support and roots are sprayed with nutrient solution, it requires very less space, very less water and no soil.

Advantages of vertical farming

- The first and the major advantage of vertical farming is producing extremely high yields per available land orarea.
- Producing the food throughout the year without the risk of vagaries of nature of nature like floods, heavy rains, uneven rains, hail and snowfall, drought, dry spells, extreme high temperatures, cold waves, epidemics of pest and diseases, etc.
- It reduces the cost over transporting loads of food grains from rural area to urban areas and reduce the spoilage occurring there in. Fossil fuel consumption in transporting the farm produce to cities from village places is also reduced to a greater extent.
- Vertical farming uses 70 to 95 % less water compared to traditional farming
- 90% less or no soil is needed in vertical farming and thereby no pest and disease infestations.
- Pesticide free or organic food is produced as there is no use of pesticides.

Disadvantages of vertical farming

- Initial huge cost for establishing the vertical farming system is the major problem. It will include the cost erecting the structures along with its automation like computerized and monitoring systems, remote control systems, programmable LED lighting systems, climate control system,etc.
- Huge energy cost as growing plant is entirely with artificial lights. The excess nutrients usedinvertical farmingmayinterfereand contaminatethemain urban water system if not taken careof.
- LED lighting systems emit heat though small amount will create problem of maintaining the temperatures especially in summer months and may overload the air conditioning systems which will again incur high energy cost.

FEASIBILITY OF VERTICAL FARMING IN INDIA

India is one of the largest producer of vegetables, fruits and many other agricultural commodities. In India, vertical farming has been introduced. ICAR experts are working on the concept of 'vertical farming' in soil-less conditions, in which food crops can be grown even on multi-storeyed buildings in metros like New Delhi, Mumbai, Kolkata and Chennai without using soil or pesticides. Small-scale adaptations of vertical farming have been seen in Nadia, West Bengal and in Punjab. Bidhan Chandra Krishi Vishwa vidhalaya in Nadia has found initial success in growing brinjal and tomato. Punjab also has succeeded in producing potato tubers through vertical farming (Kalantari *et al*., 2018).

FUTURE THRUST

- If vertical farms were integrated in the city, they will be able to supply food for the entire population.
- There is a need for research that accurately assesses the Return of Investment (ROI)

of various types and sizes of vertical farms.

- ❖ There is a need to investigate the full life-cycle analysis (LCA) and the number of years to reach parity with a traditional farm
- ❖ Researchers should invent, advance, and further develop local farming techniques to make vertical farm projects feasible in these countries.
- ❖ For example, they may invent recycling methods that reduce reliance on water, design local systems by capturing rainwater, and may capitalize on local solar power for providing natural light and energy (Kalantari *et al*., 2015).

CONCLUSION

Vertical farming is a best alternative for the city dewellers. It can deliver food in sustainable ways to improve global food security and solve the environment degradation problems. No harvest would fail by severe weather phenomenon. It has the benefit for easily minimise the cooling and heating water by indoor temperature. It helps to reduce poverty, increase food safety and well being of human. Effectiveness of vertical gardening depends on the demand and supply of food, urban population and densities, technological development, water and energysupplyand weather conditions.

REFERENCES

Ankri, D.S. 2010. Urban Kibbutz: Integrating Vertical Farming and Collective Living in Jerusalem, Israel, (Master's Thesis). Available from ProQuest Dissertations and Thesis database. (UMI No.1482437).

Despommier, D. 2010. The Vertical Farm: Feeding the World in the 21st Century; Thomas Dunne Books: New York, NY, USA.

Kalantari, F., O. Mohd Tahir, N. Golkar, and N.A. Ismail. 2015. Socio-Cultural Development of Tajan Riverfront, Sari, Iran. Adv. Environ. Biol. 2015, 9: pp. 386– 392.

Kalantari, F., O.M. Tahir, R.A. Joni, and N.A. Aminuldin. 2018. The importance of the public acceptance theory in determining the success of the vertical farming projects. Management Research and Practice, 10(1): pp. 5-16.

Padmavathy, A. and G. Poyyamoli. 2016. Enumeration of arthropods in context to Plant Diversity and Agricultural (Organic and Conventional) Management Systems. Int. J. Agric. Res. 6: pp.805–818.

Sparks, R. E. and R. M. Stwalley. 2018. Design and testing of a modified hydroponic shipping container system for urban food production. *International Journal of Applied Agricultural Sciences*, 4(4): pp. 93 -102.

Touliatos, D., I.C Dodd and M. Ainsh. 2016. Vertical farming increases lettuce yield per unit area compared to conventional horizontal hydroponics. Food Energy Security. 5: pp.184–191.

Sustainable Agriculture: Need of the hour

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Agriculture,being the dominant occupation, source of livelihood and a major addition to country's gross domestic product (GDP), should, in every possible, manner be developed so as to benefit not only the farmers, people but the nature too. The 1960 Green Revolution delivered about, by using higher quality seeds,higher strategies of irrigation and liberal use of fertilizers, pesticides and insecticides, a grain surplus India. But the cutting-edge reality is way too exclusive than what used to be in the 60s.It has turned out as a widely acknowledged fact that theimmoderate use of chemical substances and endless exhaustion of land fertility is causing a huge depletion in the expected agricultural produce. The modernized and superior "Seed and Fertilizers package" techniques might not hold the sustaining agriculture for prolonged time. The world requires practices which are ecologically just, economically viable and are primarily based on holistic scientific approach. In short, it is a call to adopt Sustainable Agriculture.

What is sustainable agriculture?

Sustainable agriculture is described as the profitable management of natural assets and wise use of technology for the purpose of agriculture to fulfilthe changing human needs, whether food or textiles, along with not solely conservation but also enhancement of quality of environment.

Objectives of sustainable agriculture

It aims to increase farm productivity, maximize social benefit with simultaneous minimization of chemical use and water wastage, prevention of soil erosion and mitigating other evil impacts of modern agricultural practices on the environmental health. It also promotes safety and preservation of indigenous biodiversity to keep the ecological balance. The critical intention is to meet the current wants and to be in position to meet those bobbing up in the coming future.

Failures of modern day techniques:

Tillage system

Tilling has traditionally been used as an approach to prepare a field for planting, controlling weeds, removing plant residue and loosening compacted surface soil. While it is fundamental for successful agro-ecological enterprise ,excess of it has led to soil erosion,related air and water pollution, subsurface soil compaction and low water retentivity. Also, lot of money is spent on gasoline and machinery.

Pressure on groundwater

Intensive irrigation has been most crucial element of the Green Revolution ,however, now has put stress on groundwater resources. In addition, irrigation without proper consideration of drainage leads to water logging and salinization and both of them together ruin the land fertility, inflicting its desertification. As of today, almost 60% of Indian land suffers from water logging and salinization.

Unregulated use of fertilizers and pesticides

It has been estimated that ,considering 1960, fertilizers consumption in northern states of India, especially Punjab, increased thirty folds causing an unprecedented alterations in the pH of soil making it unfit for cultivation. The principle culprit NPK made the soil poor in different micronutrients likes zinc, iron copper, magnesium and so forth. Likewise immoderate pesticides application to kill the pests and guard the plants suffered serious backlash and instead made the pests more resistant over the course of time.

Depletion of organic matter

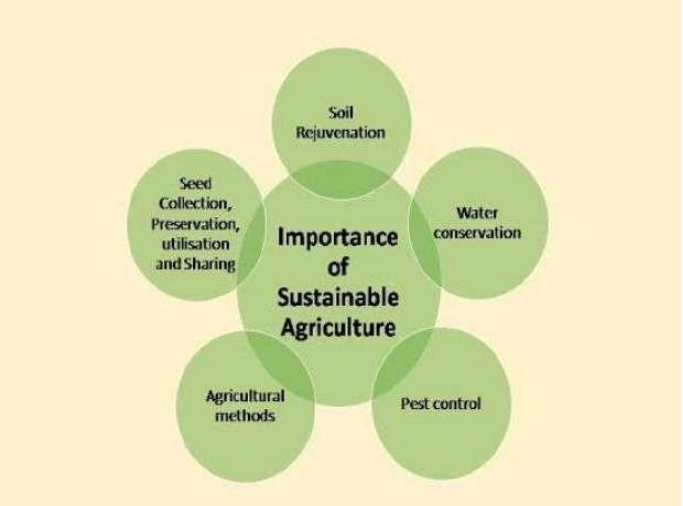
Good soil is made up of 7 to 10% of organic matter but the unfortunate practices like excessive tilling, burning of field postharvest bring about massive destruction of organic matter and plant residue which holds the soil particles together and hence the land becomes greater susceptible to soil erosion. Decrease in natural fertility and nutrient content of soil are some of its other ill effects. 30% of Indian soil is drought prone due to this reason and about 25-30 hectares of fragile land are progressively degrading.

Monoculture is the new trend

Introduction of monoculture replaced the mixtures and rotations of diverse crops like wheat, maize, millets, pulses and oilseeds. Reduction in leguminous crops deprives the soil of natural fertilizing agents. Repeated cropping of wheat and rice lead to draining of the soil off nutrients, eventually converting it into wasteland. There were thousands of varieties of grains and vegetables before the advent of modern agriculture. For an instance, there were about 30,000 strains of rice (Oryzasativa) of which only 10 are known to be cultivated today. This has led to reduction of genetic diversity, when genetic diversity is reduced we have genetically similar flora which is most prone to disease, insects and pests etc.

Farmer's plight

Desertification of land, needless boom of weed need to buy more and more fertilizers and chemicals, alarming expand in the expenditure on machinery and fuel and fluctuating earnings due to inconsistent yield through harvested crops further adds to the miseries of the farmers.



(Source: ecomwel.org)

Sustainability enhancing techniques and their advantages Conservative tilling method

For economic and ecological gain, this method aims to reduce the frequency or intensity of tillage activity. It leaves at least 30% of plant residue to cover the soil surface which prevent soil erosion due to water or wind or run off preserves nutrients and increase water holding capacity, unlike standard tilling. Increased moisture also increases the quality of organic matter.Less tilling implies less soil compaction and carbon dioxide can be readily absorbed by the soil, decreasing greenhouse effect too.

Effective cropping methods

In order to cultivate the soil and increase crop yield at the same time it is essential to abandon the insipid crop patterns used today. As alternatives, mixed cropping, intercropping, crop rotation, permaculture etc should be preferred.

Mixed cultivation of two or more crops together protects damage due to pests (as pest are crops specific) and monetary losses against complete crop failure under adversity.

Intercropping, i.e, growing more than one crop simultaneously in the same field in rows following definite pattern(1:1,1:2)preserves soil fertility, improves productivity and saves space and time to plant two or more crops.

Crop rotation is a boon without any disguise in order to overcome the current agricultural crisis. Green manure crops and legumes are primarily used as rotation crops. A possible alternative to wheat and rice crop pattern could be maize-potato-sunflowers. These crop systems require less water, lower inputs but have higher commodity prices.

Permaculture, a popular theme of today, has been practiced since time immemorial. It is intended to operate in harmony with the natural structure, place and properties of the region. Smart field design ensures optimum use of natural resources like use of local water sources for irrigation, ensuring adequate drainage to avoid logging and salinization of water etc.

All these methods not only favour the farmers but also the environment at large, and also helps to tackle the global food crisis.

Smart irrigation

Smart water management is no longer simply about how water is delivered but also when, how often and how much. Employing strategies like drip irrigation, sprinkler irrigation, check basin irrigation and more, if properly installed can save up to 80% more water than the conventional methods. But where flood irrigation is a necessity, irrigation timing should be given proper consideration. Flood irrigation at night suffers minimum water loss due to evaporation and also lets in water to seep down into the soil to replenish the water table. Thus, a smart irrigation layout not only helps in water conservation but additionally helps in increasing the crop yield.

Organic farming

Organic farming is the most talked of topic nowadays but least used and utilised in reality. When it comes to sustainability going natural is the successful approach. The idea of the usage of manure, dung compost,biofertilizers brings about soil nutrient enrichment, maximizes the ecological benefits and reduces environmental hazards. These are cheap and least expensive and can be used even by the poor farmers. Use of bioherbicides,biopesticides and bioinsecticides can in noway deteriorate the soil. Like the vast increase of cacti in India and Australia was once checked with the introduction of its natural herbivore-Cochnealinsect, to control variety of pestsbacillus thuringiensis was used successfully andefficiently. Further methods like these can be employed to protect the crops against pests and provide nourishment to the crop rather than opting for chemical fertilizers and pesticides.

Biotechnology

Use of biotechnology helps to generate vegetation which are highly tolerant to disease, weed, drought etc, for e.g.bt cotton. Use of natural methods along with the aid of some intelligent technology will increase 15 to 35% additional yield in most vegetable plants.The transgenic plants are richer in nutritional content too. The better quality transgenic wheat contains more proteins and higher lysine content.

(Source:liverur.eu)

CONCLUSION

It is need of the hour to come to our senses and build and promote an agricultural system that benefits the mankind as whole, not only economically but also ecologically. The only solution to all these problems whether economical or ecological faced by the farmers and people worldwide is adoption of Sustainable agriculture by one and all.

"*We abuse land because we regard it as a commodity belonging to us. When we see land as a commodity to which we belong, we may begin to use it with love and respect.****"- Aldo***

Methods of Fish Preservation

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Introduction

Curing as a means of preservation of fish,is one of the most old preservation technique . Cured fish refers to fish which has been cured by subjecting it to fermentation, pickling, smoking, or some combination of these before it is eaten. These food preservation processes can include adding salt, nitrates, nitrite or sugar, can involve smoking and flavoring the fish, and may include cooking it. The earliest form of curing fish was dehydration. Other methods, such as smoking fish or salt- curing also go back for hundreds of years. The term "cure" is derived from the Latin *curare*, meaning *to take care of*. It was first recorded in reference to fish in 1743 (Wikipedia/cured fish)

Modern developments have centered around understanding and controlling the processes to achieve the standardized product demanded by today's market. None the less, for all the developments in cure-processing accommodating continuous production lines, the time required to achieve a long shelf-life product purely by water removal is much greater than for any other commonly used preservation method. This is because the process relies upon the diffusion rate of either water from the center of the food to its surface, or the diffusion rate of salt (or other solute) in the opposite direction, or a combination of both

Water content, water activity (aw) and storage stability

The addition of salt is more effective weight for weight than the addition of sugar because salt ionises to a sodium cation and a chloride anion each of which attracts a sheath of water molecules.

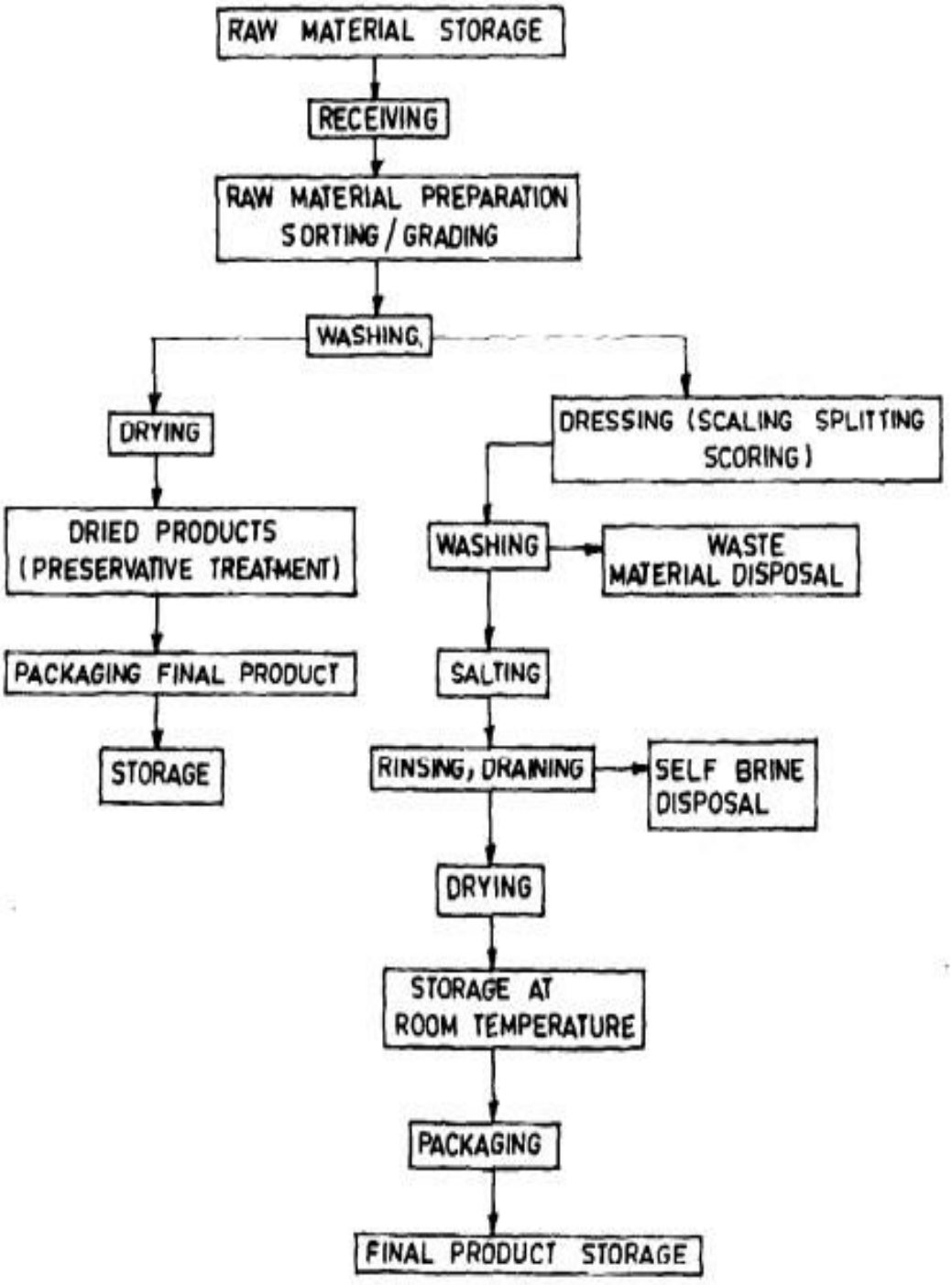
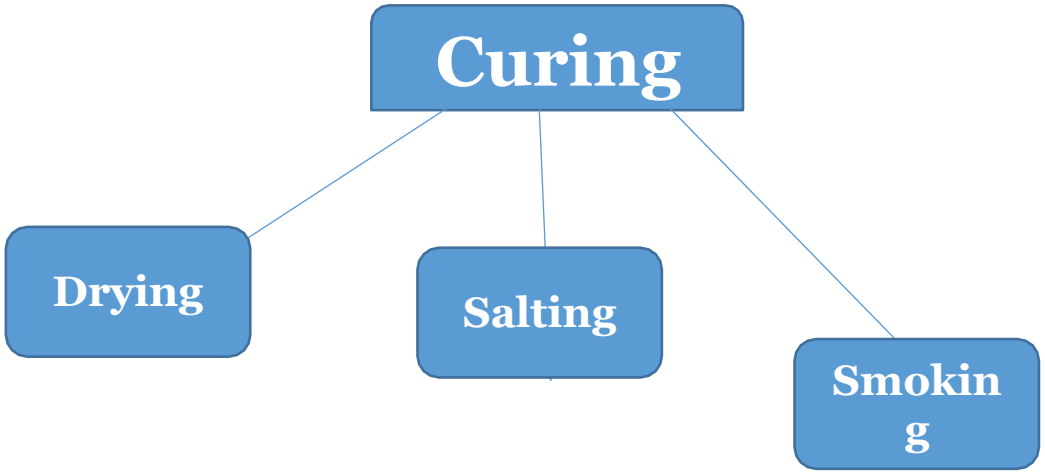


FIG. 1 FLOW DIAGRAM FOR FISH CURING OPERATION

These ionically associated water molecules are unavailable for use by micro-organisms and there is a tendency for the ionic forces to pull water molecules from the microbial cells dehydrating them to the point where they die or sporulate and lie dormant. Sucrose also withdraws water molecules from the system and holds them by hydrogen bonding. However, far fewer molecules become bound or unavailable in this way than is the case for an equal mass of sodium chloride. This availability of water in the system for use by micro-organisms directly relates to the effectiveness of preservation and can be represented physically by the water activity (aw). (GM Hall/ curing technique/page 32-33)

Types of Curing Techniques



Drying

Types of process can be employed in the drying of fish:

Sun drying ,traditional way of curing fish under sunlight. Air or contact drying, where heat is transferred to the fish from heated air or a heated surface, utilizes the air movement above the fish to carry away the moisture.

Vacuum drying, where advantage is taken of the greater evaporation rate of water from the fish at reduced pressure, utilizes conduction by contact with heated

surfaces or radiation to evaporate the water which is removed by the vacuum pump. Freeze drying relies upon the attainment of very low pressures by highly efficient vacuum pumps in a sealed chamber containing the fish. The latter, in contact with refrigerated plates, freezes. At pressures below 0.64 kPa ice sublimes and the vapour is removed from the fish by the vacuum pump.

Sun Drying

The heat of the sun and movement of air remove moisture which causes the fish to dry. In order to prevent spoilage, the moisture content needs to be reduced to 25 per cent or less. The percentage will depend on the oiliness of the fish and whether it has been salted.

Traditionally, whole small fish or split large fish are spread in the sun on the ground, or on mats, nets, roofs, or on raised racks. Sun-drying does not allow very much control Over drying times, and it also exposes the fish to attack by insects or vermin and allows contamination by sand and dirt. Such techniques are totally dependent upon the weather conditions. The ideal is dry weather with low humidity and clear skies.

FIG 2 : sun drying by native people of villages that live near riverine area and sea costs

Alternatives to sun-drying

involve the use of solar or artificial dryers. There has been a great deal of research on the development of solar dryers as an improved method of drying fish. This has shown that by achieving increased drying temperatures and reduced humidities, solar dryers can increase drying rates and produce a lower moisture content in the final products, with improvements in fish quality compared with the traditional sun-drying techniques.

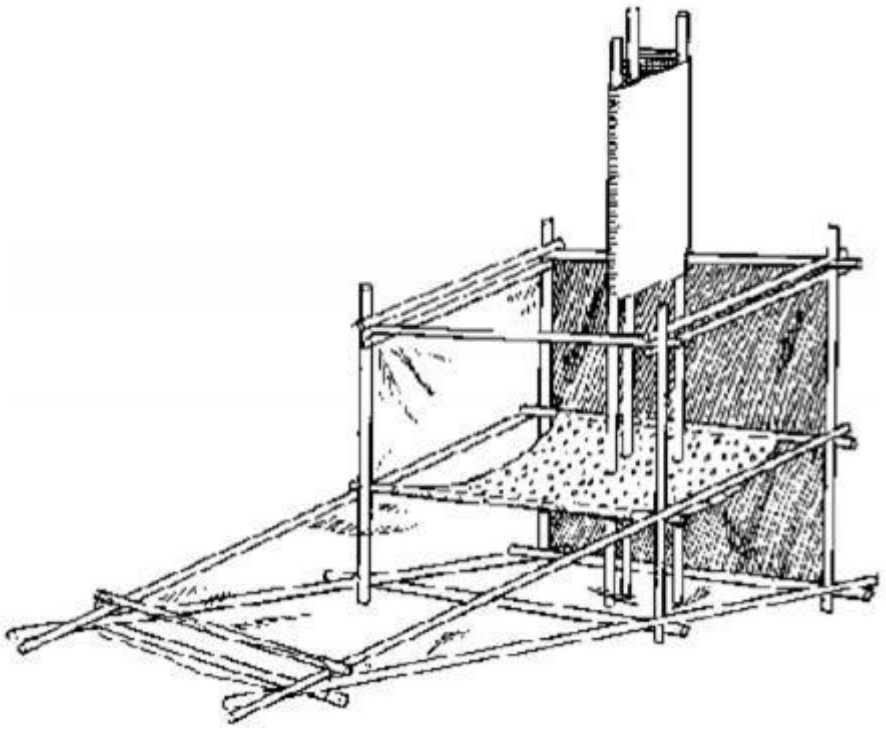


Fig 3: illustrates a solar tent dryer. This was first developed in Bangladesh, but there are now numerous variations in different parts of the world. It is probably one of the simplest designs

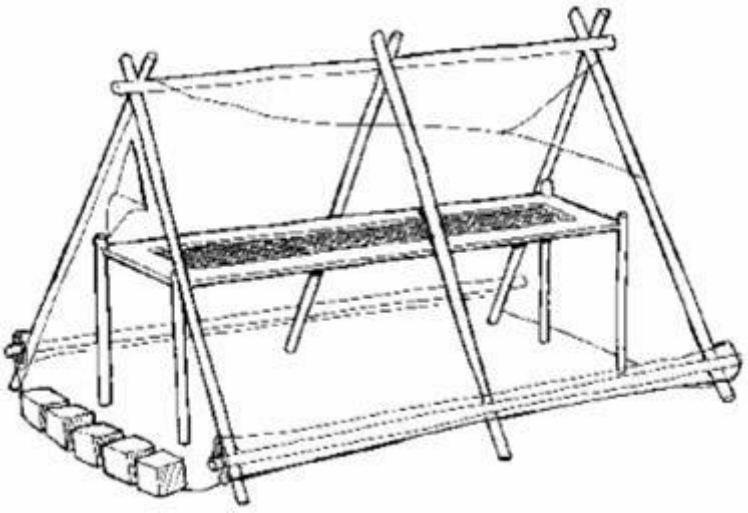


Figure 4 shows an improved solar dryer, with a separate collector and drying chamber. The chimney is painted black to absorb more heat. This will heat the air inside the chimney, thereby increasing the air flow through the dryer.

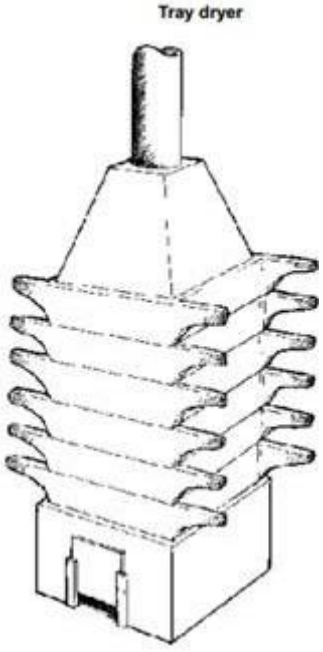


Figure 5: illustrates an artificially-heated tray dryer. When rain threatens, the trays, which were previously placed in the sun to dry, are assembled on top of each other over a simple heating compartment. A roof and chimney are placed on top, and drying continues by direct heating.

Both solar and artificial dryers try to overcome the difficulties posed by sun-drying during the rainy season. With these dryers it is possible to minimize drying times and to increase the product quality. It should however, be pointed out that it is only

advantageous to use such dryers if there is a market for a higher-quality product or if the fish would otherwise be lost.

Salt curing

Table salt (sodium chloride) is a primary ingredient used to cure fish. Removal of water and addition of salt to fish creates a solute-rich environment where osmotic pressure draws water out of microorganisms, retarding their growth. Doing this requires a concentration of salt of nearly 20%.

Most food poisoning bacteria cannot live in salty conditions and a concentration of 6-10 per cent salt in the fish tissue will prevent their activity. The product is preserved by salting and will have a longer shelf-life. However, a group of micro-organisms known as 'halophile bacteria' are salt-loving and will spoil the salted fish even at a concentration of 6-10 per cent. Further removal of the water by drying is needed to inhibit these bacteria.

During salting or brining two processes take place simultaneously:

- water moves from the fish into the solution outside
- salt moves from the solution outside into the flesh of the fish.

Salting requires minimal equipment, but the method used is important. Salt can be applied in many different ways. Traditional methods involve rubbing salt into the flesh of the fish or making alternate layers of fish and salt (recommended levels of salt usage are 30-40 per cent of the prepared weight of the fish). There is often the problem, however, that the concentration of salt in the flesh is not sufficient to preserve the fish, as it has not been uniformly applied. A better technique is brining. This involves immersing the fish into a pre-prepared solution of salt (36 per cent salt). The advantage is that the salt concentration can be more easily controlled, and salt penetration is more uniform. Brining is usually used in conjunction with drying. Ultimately the effectiveness of salting for preservation depends upon:

uniform salt concentration in the fish flesh

concentration of salt, and time taken for salting

whether or not salting is combined with other preservation methods such

As drying.

Smoking

The preservative effect of the smoking process is due to drying and the deposition in the fish flesh of the natural chemicals of wood smoke. Smoke from the burning wood contains a number of compounds which inhibit bacteria. Heat from the fire causes drying, and if the temperature is high enough, the flesh becomes cooked. Both of these factors prevent bacterial growth and enzyme activity which may cause spoilage. Fish can be smoked in a variety of ways, but as a general principle, the longer it is smoked, the longer its shelf-life will be.

Smoking can be categorized as: Cold smoking. In this method, the temperature is not high enough to cook the fish. It is not usually higher than 35°C .Hot smoking. In this method, the temperature is high enough to cook fish. Hot smoking is often the preferred method. This is because the process requires less control than cold processing and the shelf-life of the hot-smoked product is longer, because the fish is smoked until dry. Hot smoking does, however, have the disadvantage that it consumes more fuel than the cold-smoking method. Traditionally, the fish would be placed with shouldering grasses or wood. Alternatively, fish may be laid or hung on bamboo racks in the smoke of a fire (see below)

Smoking fish traditionally

There are various types of kiln available in different parts of the world, which are used for smoking. Although traditional kilos and ovens have low capital costs, they commonly have an ineffective air-flow system, which results in poor economy of fuel wood and lack of control over temperature and smoke density. Improved smokers include the oil drum smoker and the choker smoker.

Oil drum smoke

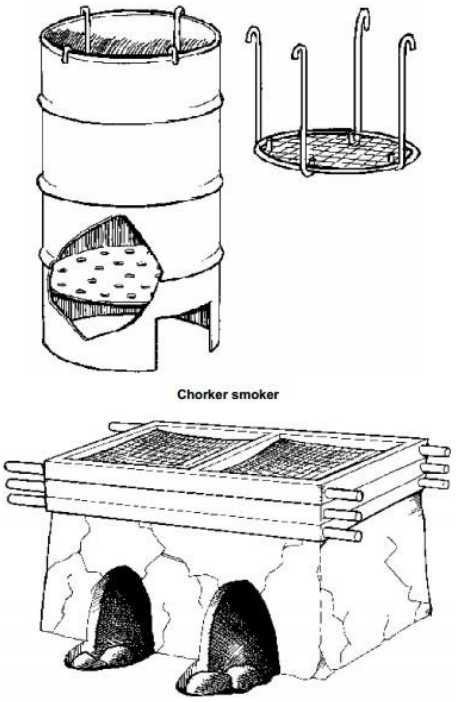


Fig 6: oil drum smoke and choker smoke machine for the production of cured fish products

Fermented fish

Fermentation is a process by which beneficial bacteria are encouraged to grow. These bacteria increase the acidity of the fish and therefore prevent the growth of spoilage and food-poisoning bacteria. Additionally, salt is used to prevent the action of spoilage bacteria and allow the fish enzymes and the beneficial acid-producing bacteria to soften (break down) the flesh. Fermentation is therefore the controlled action of the desirable micro-organisms in order to alter the flavour or texture of the fish and extend the shelf-life.The use of fermentation as a low-cost method of fish preservation is commonly practiced all over the world. There are many different types of fermented products and their nature depends largely on the extent of fermentation which has been allowed to take place.They can be categorized as.

- Fish which retains its original texture
- Pastes

- Liquids/sauces.

As with salting, there is little need for equipment other than pans and containing vessels, and the process may easily be carried out on a small scale.

Sugar curing

Sugar is sometimes added when curing fish, particularly salmon. The sugar can take many forms, including honey, corn syrup solids, and maple syrup Adding sugar alleviates the harsh flavor of the salt. It also contributes to the growth of beneficial bacteria like Lactobacillus by feeding them.

Nitrates and nitrites

Nitrates and nitrites have been used for hundreds of years to prevent botulism in fish and ensure microbial safety. Nitrates help kill bacteria, produce a characteristic flavor, and give fish a pink or red color. The use of nitrates in food preservation is controversial. This is due to the potential for the formation of nitrosamines when the preserved food is cooked at high temperature. A 2007 study by Columbia University suggests a link between eating cured meats and chronic obstructive pulmonary disease. Nitrites were posited as a possible cause the use of either compound is carefully regulated. For example, the FDA Code of Federal Regulations states that sodium nitrite may be safely used: "As a color fixative in smoked cured tuna fish products so that the level of sodium nitrite does not exceed 10 parts per million (0.001 percent) in the finished product... As a preservative and color fixative, with or without sodium nitrate, in smoked, cured sablefish, smoked, cured salmon, and smoked, cured shad so that the level of sodium nitrite does not

exceed 200 parts per million and the level of sodium nitrate does not exceed 500 parts per million in the finished product.

References

1. Wikipedia/fish curing/info.
2. Gm. Hall chapter /Chapter 2
3. www.fao.org/cured fish
4. Curing and Canning ofFishery Products: A History BY N. D. JARVIS

Overview the concept of Designer egg

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Abstract

Nutrition is played a crucial role in human life, all the necessary nutrient required for proper growth and development of all stages of human being. Egg is rich in all these nutrients required by human, hence it also known as complete food. Beside this, the new concept arrived was designer egg, having alter or manipulate the special nutrient in content of egg. Designer egg can be beneficial cardiovascular disorder and arthritis. It is most widely used in developing countries.

Keywords: Designer egg, alter, layer diet, supplementation

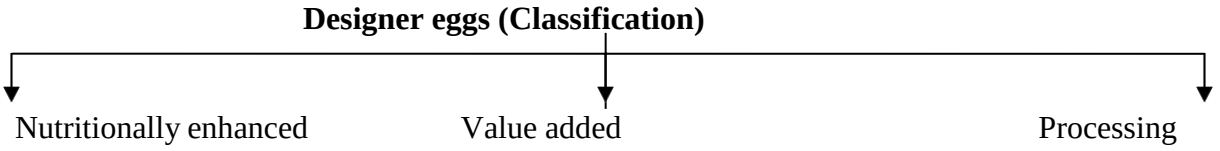
Introduction

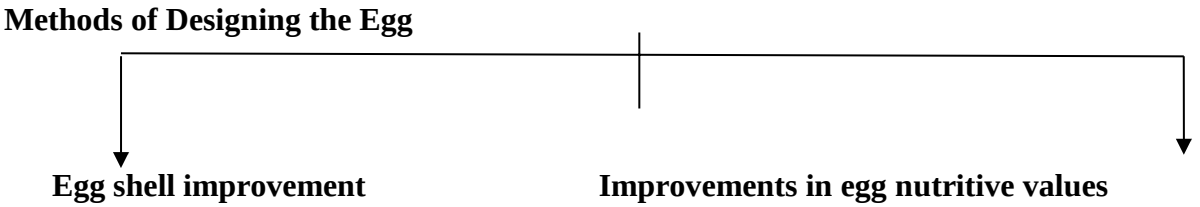
Health and nutrition is the most important factors for human resource development in the country. Nutrition is a fundamental human need to balanced healthy life. A proper diet is essential from the preliminary stage of the human for proper growth, development and to remain active. Eggs rich all necessary nutrients it could be help to nourish an embryo to a chick. Eggs are commonly known as Natures original functional food because their no adulterations in egg due to presence of egg shell. They are used world widely as food having good quality protein with low cost with highly palatable. In present status consumers are very much conscious about their health as a result demands of designer foods increasing worldwide day by day. Eggs integral part of diet packed with 13 important vitamins and minerals are present. In order to improve consumer's attention the egg is nutritionally changes, it is referred as designer or functional food**.**

Designer eggs

Designer eggs are those eggs can be altering or manipulating the content of egg from its normal contents. Designer eggs are those eggs produced by modified its normal composition which are rich in

additional nutrients and health promoting components like vitamin E, carotenoids, chelated minerals, DHA and EPA like omega 3 fatty acids selenium, and other immune modulating factors.





Egg shell improvement

By reducing the defects of eggs such as size, shape, shell thickness, colour and flavor of egg. The macro element such as calcium and phosphorus are manipulated at this stage to improve the shell structure of egg. Minerals like Zinc, Copper and Magnase, could be improve eggshell quality. The Magnase given with feed it could be improving quality of shell by increasing the glucosamine - glycans & uronic acid synthesis in the eggshell glands, which can be impact on the ultra structure of eggshells. Zinc is essential for calcification and improving of eggshell quality (Zhang, 2013).

Improvements in egg nutritive values: to changes the fatty acid composition of eggs, the increase level of CLA with omega -3 polyunsaturated fatty acids (PUFA) it including alpha-linolenic, eicosapentaenoic, doccopentaenoic and docosahexaenoic acids.

Types of Designer egg:

1) Low Cholesterol Designer: Egg is rich in cholesterol with 210 mg of cholesterol in large egg. The egg consumption in India is very low due to cholesterol scare as well as vegetarian. The supplementation of chromium (Yildiz *et al*., 2004, Sahin *et al*., 2001) and copper in layer ration to reduced the amount of cholesterol in egg. Effects of High Cholesterol: High cholesterol can be deposited around arteries and conditions leads to Atherosclerosis in vital arteries lead heart attacks and strokes.

2) Supplementation of Probiotics: the supplementation of probiotic in layer ration have been positive effect on host in term of increase secretion of digestive enzyme it cause to potentiates the utilization of nutrients lead to increase feed intake. It is also act as immuno modulator (Toms and Powrie, 2001). Probiotic supplementation in layer ration, it enhances the egg production along with reduced quantity of yolk cholesterol. The inclusion of probiotic (*Rhodobactecra psulatusin*) in layers ration at different

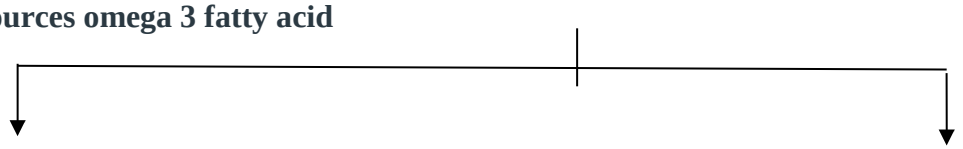
dose ranges from 0.01 to 0.04% would be reduced the quantity of yolk cholesterol along with yolk triglycerides (Khan *et al*.**,** 2011).

3) Supplementation of Herbals: Supplementation of Garlic to laying hen, it lowers the serum along with yolk cholesterol by the concentrations 0 to 12 percent of garlic in laying diet. It is also reduced the blood serum cholesterol by supplementation of garlic in layer ration. The amount of cholesterol in yolk could be reduced by inclusion of different herbal plants and products in layer ration (Yalcin *et al*., 2007)

Herbal plants	**herbal products**
basil	Roselle seeds
bay leaves	spirulina,
citrus pulp	tomato pomace
garlic	
grape seed	
pulp guar gum	

4) Omega-3 Fatty Acids enrichment: The omega-3 fatty acids, also called as n-3 fatty acids are a family of polyunsaturated fatty acids which have the first C-C double bond at the 3rd carbon position counting from the omega end of the carbon chain. Important Omega_3 fatty acids are derived largely as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) from fish oils and as a linolenic acid (LNA) from plant oil.

Sources omega 3 fatty acid



Marine type (Yannakopoulos, 2007)	Terrestrial type (Bean and Leeson, 2003)
Mostly found in deep sea, cold water fish	mostly found in plants,
fish oil and marine algae	
PUFA, DHA and EPA	soybean oil and flaxseed oil
More stable	less stable

Omega 3 fatty acids are prone susceptible to rancidity, then they add the antioxidant to diet for prevent it (Gonzalezesquerra and Leeson, 2000).

5) Conjugated linoleic acid enrichment: it is group of positional and geometrical isomers of carbon unsaturated fatty acids with two conjugated double is known as Conjugated linoleic acid. Commonly occurring, CLA are cis-9, trans-ll and cis-9, trans- 7 CLA. CLAs have anti carcinogenic, antiadipogenic, anti diabetic with anti inflammatory properties. When hens fed ration having 5 percent

CLA, it produce the egg containing 350-890 mg of CLA/egg which is fulfill the requirement of human needs of CLA. The feeding of CLA-enriched diets increase in saturated fatty acids (SFA) and reduced the unsaturated fatty acid.

6) Vitamin E enrichment in Eggs: supplementation of vitamin E in layer ration to prevent the rancidity and prolong lifespan of products. During summer, vitamin E mixed with layer ration causes to increases the egg production (Panda *et al.,* 2011) and enhances the antioxidant activity

Advantages of antioxidant enrichment of poultry eggs and meat Decreased rancidity (lipid oxidation). Prevent product from fishy taint/odour. It is rich in antioxidants in human diet. Protect the both fat-soluble and natural fat-soluble vitamin from losses or destruction.

7) Selenium enrichment in Eggs: Selenium (Se) is trace mineral and plays important role preventing the cell membrane of animal and human being from oxidative damaged. Se having a enzyme i.e. glutathione peroxidase (GSH-Px), and main function is antioxidant activity. Soybean meal diets which contain selenium in form of selenate and selenite responsible for egg enriched with selenium. Small amount of supplementation of selenium in diet improves egg weight, egg production and feed conversion ratio. In huge amount of selenium in layer diet is lethal, leads to reduce the production performance of laying hens. They reduced occurrences of arthritis, neoplasm, cholestesis, diabetes mellitus, anaemia were associated with selenium enriched egg.

Iodine-enriched designer eggs: most of the people suffered from goiter due to deficiency of iodine in developing countries. However, egg enrichment with iodine very much useful against goiter, which is rich in iodine. It is also diminished the level of plasma cholesterol in human being.

8) Pharmaceutical designer eggs: in present day, the most of the scientist worked on producing genetically modified chicken with help of genetic engineering. These genetically modified chickens raised for different types pharmaceutical compound and collected from egg. The pharmaceutical compound such as insulin which is used for remedies of diabetes and produces various types of antibody against diseases.

Commercial market for designer eggs: Kansal Agro Fanns in Panipat produces herbal eggs by addition of various types of herbal in layer diets, which containing amla, tulsi, neem. and bahera, it having a anti-bacterial, antioxidant & anti-fungal properties. This Herbal extracts are given in the poultry drinking water. This type of egg enriched with more Vitamin A, Vitamin D3, Vitamin E & folic acid than a regular/ conventional egg. These eggs contain less cholesterol content to regular eggs. These are available both at its stores and at several trade chains, supermarkets and stores.

Conclusion: The concept of designer egg is promotes the health status of human by incorporation of other essential nutrients or mineral into feed of poultry. They avoid the incorporation of any drug or

feed additives which is toxic, pr oduces the negative impact on the human. This type of egg also reduces the cholesterol level, arthritis, diabetes and heart attack in human being. Herbal supplementation in layer diet, it produces antioxidant and anti-inflammatory activity. Designer egg can be change lifestyle of human being.

References

Bean LD and Leeson (2003). Long-term effects of feeding flaxseed on performances fatty acid composition of brown' and white hens. *PoultSci.,* 82, 1288-1294.

Gonzalezesquerra R and Leeson S (2008). Effect of feeding hens' regular or deodorized flaxseed on production parameters, yolk fatty acid profile, and sensory quality of eggs. *Poult Sci.,* 87,2005-2014.

Khan SH, Atif M, Mukhtar N, Rehman A and Fareed G (2011). Effects of supplementation of multi enzyme and multi-species probiotic on production performance, egg quality, cholesterol level and immune system in laying hens. *Journal of Applied Anima Research.,* 39, 386- 398.

Panda N, Swain RK, Kaur H and Panigrahi B (2011). Importance of antioxidants Vitamins on immunity and health of animals. Veterinary Nutrition and Health, 383 -392.

Sahin K, Ondercmi L, Sahin N, Gursu MP, Vijaya J and Kucuk O (2004). Effectso f dietaryc ombinatioonf chromium and biotin on egg production, serum metabolites and egg yolk mineral and cholesterol concentrationsi n heat-distressedla ying quails. *Biol. T race Elem. Res*.101,181-192.

Toms C and Powrie F (2001). Control of intestinal inflammation by regulatory T cells. *Microbes Infect*.3,929-935

Yalcin S Onbasllar I Sehu A and Yalcin S (2007). The Effects of Dietary Garlic Powder on the Performance, Egg Traits and Blood Serum Cholesterol of Laying Quails. *Asian Aust. Journal of Animal Science* 20, 944-947.

Yannakopoulos AL (2007). Egg enrichment in omega-3fatty acids. Berlin. Heidelberg:Springer, 159- 70.

Yildiz A, Parlat SS and Yazgan O (2004). The Effects of Organic Chromium Supplementation on Production Traits and Some Serum Parameters of Laying Quails. Revue de Medicine Veterinaries 155, 642-646. ,

Zhang YN (2013). Effects of dietary zinc on eggshell quality and antioxidant status of old laying hens [Master degree thesis dissertation]. Chinese Academy of Agricultural.

Antioxidants and Kidney stones

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Abstract

Oxidative stress produced by excess of reactive oxygen species has been implicated in the pathology of many diseases such as inflammatory conditions, skin allergy, kidney stone formation, cataract formation, cancer, diabetes and ageing. Diet rich in antioxidant, polyphenols and other phytonutrient play an important role in the general health of humans, especially if they are inexpensive and easily available. The aim of our present article is to appraise the anti-lilithiatic and anti-cataract activity of *Camellia sinensis.*

Introduction

SYSTEMATIC POSITION

Kingdom	Plantae
Division	Tracheobionta
Class	Magnoliopsida
Order	Theales
Family	Theaceae
Genus	*Camellia L.*
Species	*Camellia sinensis*

Since Ancient times plant extracts of various part of the plant such as root, leaves and stems are used to cure the diseases .This is the reason that well known or claimed plants are being studied these days to get benefit out of that. Knowledge that we have these days have been acquired by many trial and error method study of the

acclaimed plants. The beneficial properties of plant is attributed to its antioxidant ,antibacterial and other properties such as phytochemical constituent etc. out of these antioxidant property of plant is considered as something that can substitute medicine.

In this project herbal extract of plant *Camellia Sinensis* or Tea which is the second most consumed beverage in the world after the water has been observed. There are many varieties of tea available in the markets .i.e. green, black and white. Among all these three tea green is considered as the most beneficial to mankind as compared to rest. Green tea is obtained from Camellia Sinensis which is a angiosperm dicot plant .It is one of the native evergreen herb of South East Asia . Tea is basically manufactured in four basic forms.ie green, white, oolong, black. leaves of the plant or buds are steamed soon after the harvesting to deactivate polyphenols oxidase, the enzymes that are responsible for destruction of catachins. Green tea contains various catachins such as EGCG,EG,EGC and ECG.

Mc Naught , an British Army Surgeon, documented the antibacterial action of tea when he found that tea killed the causal Organisms of typhoid fever (*S.typhi*) and brucellosis (*B.melitensis*). Research report that about 3 billion of kg of tea is produced and consumed every year . Japan, India, China are the main country to consume this amount of tea every year . Total 78% of the tea is consumed by the western countries, 20% green tea is consumed by Asian countries and 2% of oolong tea is consumed by China (Gomkawa et al., 2002).

Green Tea is the tea which carry highest amount of phytonutrient but lesser amount of caffeine as compared to other tea which is because of the rich source of polyphenols which is well known for possessing powerful antioxidant properties. Beside these properties it also possess anti-bacterial, antiviral, anti-carcinogenic and anti-mutagenic properties (Archana et al ., 2011).

In recent years various medical studies have proved that green tea prevents various diseases such as diabeties ,urolithiasis, skin damages ,obesities ,oral health ,prevents hair loss ,protects against cardiovascular diseases, improves insulin sensitivity etc. Antioxidant properties of green tea is high as compared to other tea, these antioxidants are called as polyphenols. A huge number of evidences support that behind strong antioxidant property of green tea, flavonoids has a role in reduction of the production of free radicals (Mckay et al., 2002).

It is is the antioxidant properties of green tea that it is been used for treating glucose induced cataract and kidney stone formation. Various parameters has been done in vitro to antilithiatic and anticataract activity of green and black tea.

Cataract is defined as the cloudiness of crystalline lens which can be divided into congenital or age related cataract .Oxidative stress plays vital role in glucose induced cataract due to the formation of 0_2 radicals and H_2O_2 that easily reacts with biomolecules. Antioxidant such as Vitamin E Ascorbic acid, glutathione counteract the reactive oxygen species. Furthermore enzymatic and non-enzymatic defense system of antioxidants are reduced in the lens and so as in the humor during the aging and causes the cataract .whereas in the hyperglycemic condition the accumulation of sorbitol leads to damage the lens which get produced as a result of conversion of glucose into sorbitol. As the lens swells up, permeability of membrane decrease and oxidative stress produces the free radicals and ROS that induces cataract. (Shabeer et al., 2011)

According to World Health Organization (WHO), cataract is the leading cause reversible blindness and visual impairments in more than 17million (47.8%) of the 37 million blind individuals worldwide, and this number is projected to reach 40 million by 2020. (WHO 2005) and in the Beaver Dam Eye Study (BDES), the prevalence of cataract increases with age It reported that 38. 8 % of men and 45.9% of women older than 75 years had visually significant cataract (Klein et al. 1998). In India, cataract formation is more commonly observed among aged subjects. It is the leading cause of evitable blindness

People with cataract can show one or more of the following symptoms: Gradual diminution of visual acuity, glare, frequent change in eyeglasses prescription and change in color appreciation. General symptoms include cloudy vision, glare at night time, Halo around lights, double or multiple vision and Changes in colors and contrast.

The senile cataract condition may be discovered by a general practitioner or optometrist, followed by referral to an ophthalmic surgeon for confirmation of the diagnosis and management. The diagnosis is made with ocular examination using slit-lamp bio microscopy after dilatation with 1.0% tropic amide (Mydriacy) 2.5% Phenylephrine hydrochloride (Neosynephrine) reagents.

The cure for cataract is nothing but surgery. However, this surgery is not proved to be beneficial for all. In this present condition Surgery is the only treatment after the opacification of lens taken place. This is usually accompanied by implantation of an intraocular lens (IOL) to replace the focusing power of the natural lens .

Secondly green tea is effective in preventing kidney stone formation which is one of the disease considered as the oldest and most wide spread disease that man know. In India people

living in different states uses different plants for curing urolithiasis. .It is considered as the third most common affliction and multifactorial disease of the urinary tract. The evidence that urolithiasis is multifactorial disease has been done from epidemiological studies. Factors such as age sex, diet, climate, race, geographical distribution and hereditary are some of the factors. The disease is found in many parts of the world particularly in areas known as "stone Belt". Although calculus disease is not fetal bit it has considerable morbidity and is one of the most painful condition .Bladder stone are usually found in the children whereas renal lithiasis is found in adults

The prevalence of renal stones is predominant in males and is 4 to 14 % while in females it is between 3to 6 %(Johnson et al., 1979). The overall probability of forming stones differ in various parts of the world and is estimated as 1-5%in Asia, 5-9% in Europe, 13% in North America and the recurrence rate of renal stones about 75% in 20 years span . It occurs both in men and women but the risk is generally high in men and is becoming more common in young women (Sandhya et al ., 2010; Prasad et al., 2007)

Amongst the etiology the simple hypothesis of stone formation is the spontaneous precipitation from urine of a crystals or aggregate of crystals, large enough to become trapped at some narrow section of the urinary tract .These trapped particles act as nidus for the formation of a stone .Several investigators suggest that stones are usually formed by precipitation of calcium oxalate, uric acid and urate which are supersaturated in the urine. The stones vary in size from a pin's head to a coconut in size and physical properties the stone vary considerably .Some stone can be easily sectioned and some crumble and other cannot be ground at all. The stone may be smooth ,flanked ,uneven or covered by sharp crystals .The composition and structure vary markedly from one stone to another .There are following types of urinary calculi have been identified, they are.

Calcium stones the stones usually contain calcium as either oxalate or phosphate and calcium oxalate stones contain calcium oxalate monohydrate or a calcium Oxalate dehydrate .Calcium stones account for 75-80% of all urinary calculi (Takaski, 1986).

Calcium oxalate stones are usually hard ,difficult to crush or cut across and are light brown to brownish black in color .they have rough surface and the internal cut surface shows striation and concentric lamination around nucleus .they are found in sterile urine and are found in acid urine (Gerchoff,1962).

Calcium phosphate stones are usually smooth, round or irregular, fined grained, soft and compact in structure. They vary in color from white to yellow brown to brown. Mostly

phosphate stones are of mixed type and occur in upper and lower urinary tract .In condition like that hyperparathyroidism and renal tubular acidosis, calcium phosphate stones are usually formed.

Infection Stones are usually dirty to creamy white in color cellular in structure . Stones are usually large .Struvite and carbonate apatite stones occur in patient with urinary tract infection because of ureas produced by the organism of infection .Infection stones disease is common in patient who have stasis urine flow due to congenital abnormalities of the urinary tract or have had spinal cord disease ,prostatic hypertrophy etc.

Uric acid and Urate Stones is the end product of the degradation of purine compounds in human. Purine nucleotide within the body cells, except in mature erythrocyte .The enzyme hypo-xanthine guanine phosphoribosyl tranferase is used for the reutilization of purines, hypoxanthine and guanine to form their respective ribonucleotides .

It is necessary to identify the cause of disease and thereby provide a rationale for treatment and obtain information to predict recurrence so that preventive measures may be instituted. Any stone formation presenting with first episode should be subjected number of routine screening procedure, which in some instance, will identify a cause of stone .the procedure include the recording of a detailed history and x ray, qualitative analysis of the stone and measurement of blood and urinary constituen.

Conclusion

It can be concluded that the tea possesses significant antilithiatic and antcataract reducing ability. Thus, we should incorporate intake of tea in our diet to prevent diseases like cancer, diabetes, kidney stone formation, cardiovascular diseases and cataract formation, which are occurring as a result of accumulation of free radicals in the body.

Reference

Gomikawa, Shuzou, & Yuichi I. 'Effects Of Catechins And Ground Green Tea Drinking On The Susceptibility Of Plasma And LDL To The Oxidation In Vitro And Ex Vivo'. *Journal of Clinical Biochemistry and Nutrition* 32 (2002): 55-68.

Archana S & jayanthi A. Comparative analysis of antimicrobial activity of leaf extarct from fresh green tea, commercial green tea and black tea pathogens. j App pharmaceutical science 2011;01(08):149-52.

McKay, Diane L & Jeffrey B. Blumberg. 'The Role Of Tea In Human Health: An Update'. *Journal of the American College of Nutrition* 21.1 (2002): 1-13.

Shabeer, Niyas Ahmed & Ashar W. 'Anticataract Activity Of Ethanolic Extract Of Nigella Sativa On

Glucose Induced Cataract In Goat Eye Lens'. International journal of applied biology and pharmaceutical technology 2.4 (2011): 247,275.

Klein, CL. Olsson & J. Nielsen. 'Glucose Control In Saccharomyces Cerevisiae: The Role Of MIG1 In Metabolic Functions'. *Microbiology* 144.1 (1998): 13-24.

Johnson, Christopher M *et al*. 'Renal Stone Epidemiology: A 25-Year Study In Rochester, Minnesota'. *Kidney International* 16.5 (1979): 624-631.

Sandhya, Devi Gundimeda & Sreedevi V. 'Kidney Stone Disease: Etiology And Evaluation'. *nternational Journal of Applied Biology and Pharmaceutical Technology* 1.1 (2010): 175-177.

Prasad, D sujatha & K. Bharathi.Herbal Drugs in Urolithiasis-A review.Pharmacogn Rev 2007;1.1:175-9.

Occupational Exposures to Endotoxins

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Abstract

Gram-negative bacteria like *Escherichia coli*, *Pseudomonas luteola*, *Bacillus cereus* etc. are characterised by having an outer membrane in which a structural component is lipopolysaccharide (LPS), which varies in chemical structure in different gram-negative species and even among strains of the same species. LPS has endotoxin activity, whose potency varies among species to species and is considered a potent pro-inflammatory molecule. Endotoxins are present ubiquitously in the indoor, occupational & outdoor environment and there is always a danger of substantial endotoxin presence in the surrounding environments due to the shedding of bacterial cell wall or bacterial lysis. In this short review we have highlighted the presence of endotoxins in livestock, agricultural and food sector.

Introduction

Endotoxin is the core component in the outer membrane of most of gram-negative bacteria and is considered as the potent pro inflammatory molecule. Their purified derivatives are called lipopolysaccharides (LPS) (Michel 2000), which are highly toxic substances to other organisms. Bacterial endotoxins are considered to be the most frequently reported pyrogens. LPS is known as one of the most effective immune activators, causing non-specific immune reactions in the host tissues (Rauber *et al* 2014). There is always a danger of substantial endotoxin or LPS contamination in many different environments due to their ubiquitous presence and due to the shedding

of bacterial cell wall or bacterial lysis (Biomin 2016). LPS are chemically composed of an outer O-polysaccharide chain (40 repeat units), an inner R- polysaccharide chain and lipid A (Disaccharide phosphate and Fatty acid chains). The latter is the toxic part of the molecule. Levels of toxicity depends on this lipid A portion of endotoxin and which varies in different species of bacteria.

Endotoxins in Livestock Industry

Livestock involves raising the animals like cattle, swine, sheep, horses, and to a lesser extent, goats and mules, and the processing of the animal products for consumers. Livestock provides food items such as Milk, Meat and Eggs and also contributes to the production of wool, hair, hides, and pelts. Dung and other animal wastes serve as very good farmyard manure and the value of it is worth several crores of rupees. Diseased or Susceptible animals are more prone to endotoxin exposure. There are many reasons of endotoxin exposure to livestock like transport of livestock which sometimes turn out to be most stressful and injurious stage in the chain of operations between farm and target spots resulting in poor animal welfare and loss of production. Modern and commonly used dairy breeds like the Holstein Friesian are developed in northern countries so they are tolerant towards cold weather conditions but more susceptible to long hot summers which leads to heat stress. Each year over US$ 1 billion are lost due to heat stress in cattle in the United States alone. Annual losses in dairy and beef are estimated to be $ 897 million and $ 369 million, respectively (Dairy Global, 2019).

Heat stress can disrupt the rumen, harm the gut integrity and affects several physiological functions. The disruption of the rumen or sub-acute rumen acidosis (SARA) and impaired gut barrier can lead to the translocation of toxins (e.g., endotoxins, mycotoxins) as well as unwanted metabolites (e.g., biogenic amines such as histamine) into the blood circulation and generates a strong inflammatory response. Endotoxins bind to TLR-4 receptors and upregulates the cytokines like IL-6, TNF- α and IL-1β. This Inflammatory cascade triggers the acute phase proteins e.g., haptoglobin, LPS-binding protein (Nicole 2020). This acute phase response consumes a lot of energy, which the animal cannot use anymore for growth or milk production. In the worst case, high amounts of endotoxins can result in septic shock and even death which is also defined as Endotoxemia. (All about feed, 2016) A recent study from the research group at Iowa State University showed that the *in vivo* administration of

endotoxins drastically decreased the milk yield in Holstein cows by 80%.

Another main reason of endotoxin exposure is through the feed additives. Livestock are frequently exposed to a relatively high content of endotoxin in the diet. In fact, the workers processing a dusty additive may also be exposed to hazardous amounts of endotoxin even if the endotoxin concentration of the product is low. Farm workers and workers in the premixture factory, i.e., where minerals/vitamins/trace nutrients supplements are prepared are more susceptible to endotoxins arising from feed additives and from animal faeces. (Health council 2010)

Endotoxins in Agricultural Industry

Agriculture is the primary source of livelihood for about 60% of India's population and demand for agricultural inputs and allied services like warehousing and cold storages is increasing in India at a fast pace (IBEF,2020). Workers involved in cultivating, harvesting, storing or processing of agricultural products may be exposed, via the respiratory route, to a wide range of airborne biological agents such as microorganisms, endotoxin, peptidoglycan, glucans, lipoteichoic acid, and allergens. Modern agronomy which enables the use of agrochemicals like pesticides and fertilizers and various technological advancements have sharply increased yields, but poses widespread ecological and environmental threat. (Skórska 2005). Farmers working with cotton are highly exposed to cotton dust often contaminated with gram- negative bacteria containing endotoxins (Paudyal *et al* 2011). Mukherjee *et al* (2004) in a study conducted on Indian jute mill workers found that increased exposure to bacterial endotoxin in airborne dust causes respiratory problems.

Some researchers have reported that LPS, in synergy with other substances present in organic dust or with pesticides, plays an essential role in airway inflammation and bronchoconstriction. High occupational endotoxin exposure via inhalation is prevalent in agricultural and related industries. Recently it was reported that lindane and indoxacarb along with co-exposure with endotoxins causes changes in lung morphology and alters TLR-4 and TNF-α (Tewari *et al* 2016) and TLR-9 expression, respectively (Kaur *et al* 2016). Various studies shows that LPS interaction with various classes of pesticides modulates pulmonary responses during pesticide induced lung insult (Pandit et al 2017; Sethi et al 2017; Verma et al 2018).

Endotoxins in Food Industry

The incidence of food-borne infections has increased globally with a significant number of human populations at risk (Cho et al., 2011) and Gram-negative and Gram-positive bacteria pathogens are at the epicentre of most reported cases (Sudershan et al., 2014). Apart from the fact that Gram-negative bacteria in fermented foods may cause infections, they can be toxigenic, producing endotoxins in foods. The potency of endotoxin varies amongst different bacterial species but E. coli produces LPS with extremely high endotoxin activity, hence it is often used as the model organism (Raetz and Whitfield, 2002). The endotoxins present in various foods can be associated with several factors affecting the quality of these food products along the food chain. Exposure to these harmful toxins can occur at any stage and Poor food safety knowledge, use of contaminated raw materials, utilization of polluted water, inadequate hygienic practices, unstandardized production processes, mixed-culture processing, deplorable hygiene status of processing environments, poor packaging, inadequate preservation techniques, are some of the factors that provoke the presence of these pathogenic organisms in foods. The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. Therefore, to reduce the presence of Gram-negative bacteria and their toxins in the food products proper assessment tests should be carried out and further development and enactment of adaptable food safety measures should be done.

Conclusion

Bacterial endotoxins are considered to be the most frequently reported pyrogens and they can act as allergen, inflammatory mediator, or in some other way can affect the normal physiology of humans. There occurrence can be generated from various sources such as vegetable market, poultry, animal farms, and textile industry and food processing industries. Number of measures like Dusting potential and endotoxin activity using LAL assay or rapid point of care kits should be checked time to time to diminish the risk of endotoxin exposure.

Refernces

Biomin. 2016. www.biomin.net. Endotoxins and their negative impact on poultry.

Cho, J.I., Lee, S.H., Lim, J.S. *et al.* Detection and distribution of food-borne bacteria in ready-to-eat foods in Korea. *Food Sci Biotechnol* **20,** 525 (2011).

Health Council of the Netherlands. Endotoxins 2010. Health-based recommended occupational exposure limit. The Hague: Health Council of the Netherlands; 2010. publication no. 2010/04OSH

Kaur S, Mukhopadhyay CS, Sethi RS. Chronic exposure to indoxacarb and pulmonary expressionoftoll-like receptor-9 in mice. *Vet World* 2016; 9:1282.

Michel O. 2000. Systemic and local airways inflammatory response to endotoxin. *Toxicology* **152(1-3):** 25-30.

Mukherjee, Ashit & Chattopadhyay, Bhakar & Bhattacharya, Sanat & Saiyed, Habibullah. 2004. Airborne Endotoxin and Its Relationship to Pulmonary Function among Workers in an Indian Jute Mill. *Archives of environmental health* **59**: 202-8.

Nicole Reisinger,* Caroline Emsenhuber, Barbara Doupovec, Elisabeth Mayer, Gerd Schatzmayr, Veronika Nagl, and Bertrand Grenier. 2020. Endotoxin Translocation and Gut Inflammation Are Increased in Broiler Chickens Receiving an Oral Lipopolysaccharide (LPS) Bolus during Heat Stress *Toxins* 12(622) doi:10.3390/toxins12100622

Pandit AA, Mukhopadhyay CS, Sethi RS. Expression of TLR-9 and IL-1 following concomitant exposure to Imidacloprid and endotoxin. *Pestic Res J* 2017; 29:243–50.

Paudyal Priyamvada, Semple Sean, Niven Robert, Gael Tavernier, Jonathan G. Ayres. 2011. Exposure to Dust and Endotoxin in Textile Processing Workers. *The Annals of Occupational Hygiene* **55(4)**: 403–409.

Raetz CRH, Whitfield C 2002. Lipopolysaccharide endotoxins. Annu. Rev. Biochem. 71, 635-700.

Rauber R, Perlin V, Fin C, Mallmann A, Miranda D, Giacomini L. & do Nascimento V. 2014. Interference of *Salmonella typhimurium* lipopolysaccharide on performance and biological parameters of broiler chickens. *Revista Brasileira de Ciencia Avícola* **16:** 77–81.

Sethi RS, Schneberger D, Charavaryamath C Singh B. Pulmonary innate inflammatory responses to agricultural occupational contaminants. *Cell Tissue Res* 2017; 367:627–642.

Skórska C, Sitkowska J, Krysińska-Traczyk E, Cholewa G, Dutkiewicz J: Exposure to airborne microorganisms, dust and endotoxin during processing of peppermint and chamomile herbs on farms. Ann Agric Environ Med 2005, 12, 281-288.

Sudershan R V, Naveen R, Kashinath L, Bhaskar V, and Polasa K. 2014. Foodborne Infections and Intoxications in Hyderabad India Volume 2014 |Article ID 942961 | https://doi.org/10.1155/2014/942961

Tewari A, Sethi RS, Banga HS Singh B, Gill J. Concomitant effect of low dose of lindane and intranasal lipopolysaccharide on respiratory system of mice. *Hum Exp Toxicol*. 2017; 36:1201–1211.

Verma G, Mukhopadhyay CS, Verma R singh B. Sethi RS. Long-term exposures to ethion and endotoxin cause lung inflammation and induce genotoxicity in mice. *Cell Tissue Res* 2018; 10.1007/ s00441-018-2912-0

Hormonal Control of Behavior

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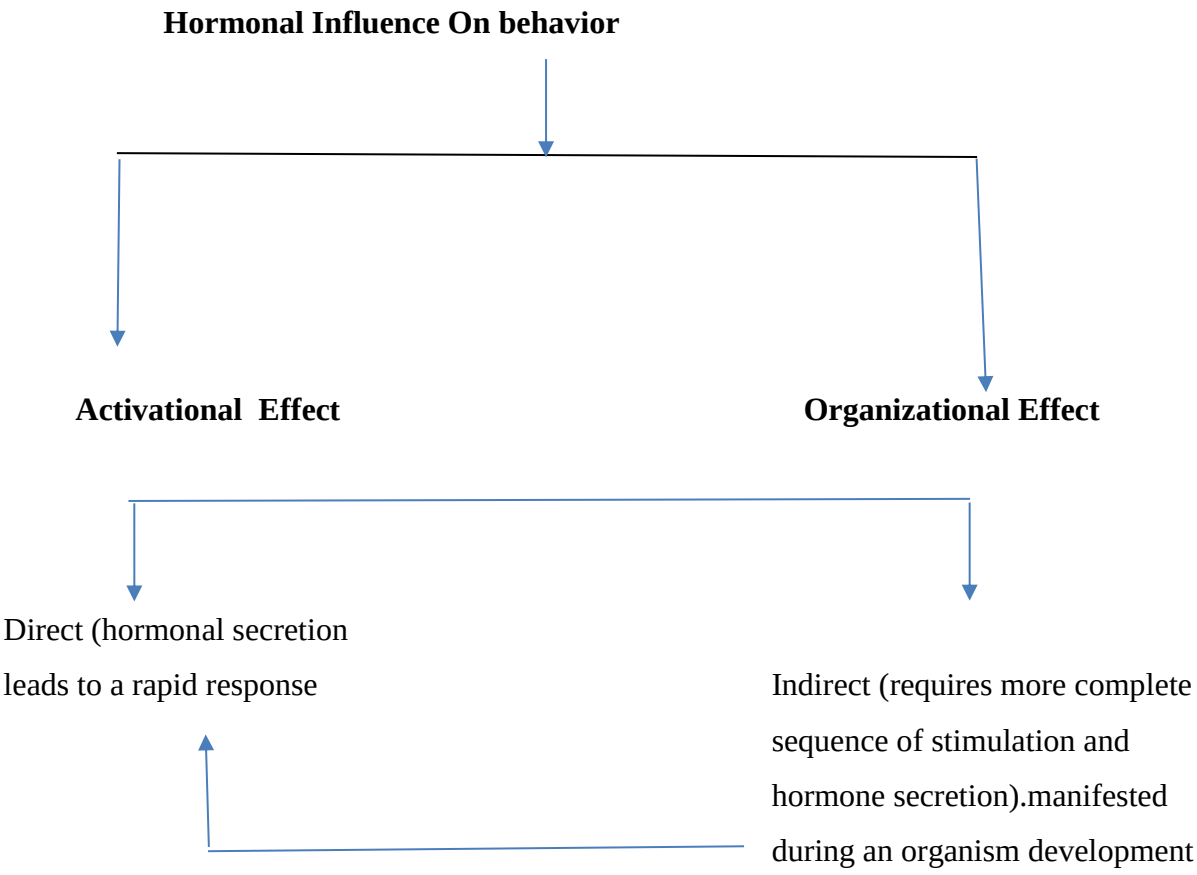
Abstract

Endocrine system consist of many ductless or endocrine glands which secrete hormones. Homrones reach all over the body through blood and act as chemical messengers. Hormones are protenaceous chemical substance produced by various parts of body or by the neurons called neuro secretory cells . In this article i have studied the role of endocrine system as a behavior regulating mechanism in both invertebrates and vertebrates through the production of Hormones .

Introduction

Since behavioral studies are based on experiment, let us consider two examples just to understand the importance of hormones in behavioral mechanism.

Example 1. If a male rate is placed with sexually mature female rat, in matter of second it will mount on the female and copulate, which in the case of a castrated male rat takes longer to initiate mounting. Since the testes are a source of androgen hormones that effect reproductive behavior, injection of synthetic androgens can replace the hormone normally and restore mount lantencies to normal levels.The following classification will give a clear understanding of different types of effects.



Dual system of Relationship between nervous and endocrine System

The nervous and endocrine system are feedback system that form key points of the body's mechanism. Both in invertebrates and vertebrates show a dual system of interrelationship .i.e. glands are interconnected through the circulatory system or they are closely tied to the nervous system through names connecting with the brain.

Experimental method and their Effects

the Hormones that influence the behavior can be divided in two parts –educational and organizational effects. **Educational effect** influence on the expression is an information of behavioral pattern whereas **organizational Effect** is manifested during organism's development

Techniques to explore the interrelationship between Hormone and behavior : Investigators have used several techniques to explore the interrelationship between hormone and behavior .these includes;

- Removal of a particular endocrine gland to assess the absence of specific hormone on behavior
- Hormone replacement therapy-injection of specific hormone or transplantation of a gland
- Blood transfusion to transfer the 'hormonal state of one animal to another in order to observe the behavioral effect.
- Bioassays to indirectly asses circulating hormone levels by measuring a secondary characterstics such as a skin gland that is dependent on a particular hormone .
- Radioimmunoassays to directly measure the circulating levels of a hormone through the use of immunological method .
- Autoradiography to localize the sites at which hormone's uptake occur.

Activational Effect

Sexual attraction: The female cockroach and moth releases Pheromones, which acts as a sex attractants for male. **Example**- if the corpus allatum of female cockroach is removed surgically after moulting, so that the female will no longer produce pheromones after it become sexually mature but if corpus allatum of other adult female is transplanted to it, then it again starts producing pheromone.

Eclosion : Eclosion hormone is produced by neurosecretory cells. when adult form of an insect emerges from the pupa after metamorphosis , then this process is termed "**eclosion**". This is the activational effect which is controlled hormonally. The eclosion hormone play a critical role in this process..

Examples: if the eclosion hormone is circulated into pupae that are near the end of the metamorphosis eclosion behavior, such as abdomen movement and being spreading after emergence can be activated at any time.

Development phase : In adult male desert locust, sexual behavior is exhibited when corpora allata are removed and when transplanted from other locust, it restore its sexual behabior. while similar experiments have revealed that corpora allata are not needed for the sexual behavior.

Moulting : Many crustaceans moult periodically as they grind. Removal of both eyes talk in these animal shorten the interval between moults. If these are given the extracts of particular neurosecretory gland, moulting is prevented clearly. The gland produces a moult inhibiting factor.

Color change : In spring season, the short tailed measles change their color. The Metamorphosis stimulating Hormone (MSH) secretion increases and new brown hair replace the white coat color during the full month . MSH secretion is inhibited by the action of another hormone melatonis secretion by the sexual gland, the hair then is not argumented

and returns to white.

Aggression and sexual behavior : Testosterone effect both on sexual and aggression behavior .for example when male ring doves are castrated, they show decreased levels of aggression courtship and copulation behavior, when treated with crystalline testesteron, the normal levels of behavior are restored.

Secondary Sexual Characterstics: examples –male cat which sprays urine probably as marked behavior; often cease to spray after their testes are removed .

Organisational effect

This can be understood by the following **example** in guinea pig and rheus monkey. When the female progeny were treated with androgens, they exhibited frequent change in their external genitalia they masculinized, developed male secondary sexual characters.

Endocrine environmental Behavior Interaction: Some activational effects involve complex interaction among behavior, hormone and specific environmental stimuli. This interrelationship has been illustrated by taking an example of reproductive sequence in ring doves.

Reproductive sequence in Ring doves: This is sequence in which at each stage the internal state of each kind interacts with external variables to produce the observed behavior pattern. these consist of :

- The hormonal state of both male and female dove except feedback loops
- The behavior of each member of the pair that stimulates changes in the hormonal levels and behavior of its mate .
- Environmental eves such as nests and eggs ,that influence hormones and behavioral changes in both .

Daniel lehrenan and his colleagues used three experimental groups to determine whether the presence of a mate or the nesting material affect incubation behavior of female ring dove.these are:

- Control for males housed alone
- Females housed with a mate only
- Female housed with a male and nesting material

They assessed the results of these pairing in terms of the percentage of test female in each group that exhibited incubation behavior when presented with a nest containing eggs .Control females never incubated eggs. By days 6,7, 8 in the second

groups those house with only a mate ,incubated eggs by the day .hundred percent of females caged with both a male and nesting material incubated test eggs. Thus, they concluded that presence of both a male and nesting material is necessary for complex incubation behavior in a female.

Migratory behavior in birds : In birds ,migratory behavior is also due to the result of interaction between the environment and the hormones .

Reowan suggested that several factors influences migration .increasing temperature,increasing day length ,embition and many other changes which affect the animal through pituitary activity ,and perhaps ,the nervous system directly .

Mechanism and Ontogeny of Hormonal Effects

Stimuli and Mechanism: the mechanism by which hormones affect behavior is very complex,so it is verey necessary to know the action of hormonal effect upon behavior ,and its stimulation and release. Hormones may influence behavior through their effects upon:

- The whole organism (for example ,general activity level)
- Morphogenetic structure employed in specific response pattern
- Peripheral receptor mechanism .
- Integral functions of C.N.S:

  Control of this development of nervous organization.

  Control of periodic growth.

  Control of sensitivity

Ontogenetic development : there are so many examples which prove that some interaction of hormonal action and behavioral development establishes influences .such as,if a baby which is injected the testosterone exhibits complete mating response including covering treading .etc .

Some recent Development : some recent research developed the delicate and complex inter-relationship ,between hormones, the nervous system, and behavior .

- D.S Lehreman (1964) has recently made three discoveries about the role of prolactin in parental behavior in doves:
- Prolactin alone does not elicit parental behavior ,but requires estrogenic priming
- Hormone can act directly on structure involved in behavior without any vagus effect o the CNS
- The young birds provide the tactile stimuli that elicit regurgitation from the crop.

Hinde (1958) explored the hormonal bases, and external stimulus condition and controlling

nest formation.

Another interesting approach to hormones and behavior has been explained by the work of R.P.Michael regarding sexuality on the verge of nymphomania.

Hormone can control behavior directly or indirectly .there are hormones which have direct control or influence on the secondary sexual character,colour of plumage and skin,courtship and subsequently mating (examples., testosterone,oaestrogen),on aggression,fleeing,or fighting (for example.,adrenalin),on nest building ,egg laying ,and parental care (for example.,oxytocin,prolacting).but hormone like angiotensin(produced from kidney)first causes rise in blood pressure ,later stimulates urine production,thirst and defection –all these activities are includes in behavior .

Influence of hormone on behavior may either be slow and prolonged ,or quick and short lived ,luteinizing Hormone(LH) stimulates the ovary to produce oestrogen and progesterone,which are responsible fro the development of the mammary glands in females at puberty. During pregnancy ,there is a rise in the level of prolactin and this stimulates milk secretion .when the newly born suckles ,the mechanical stimulates induces the hypothalamus to release oxytocin from the posterior pituitary lobe,in turn behavior has its effect on hormone secretion ;the females of small mammals like rabbit and cat start ovulating ony after they have mated ,the stimulus of thrusting of penis is needed to start production of luteinizing hormone from pituitary and that causes ovulation .

The hormones controlling behavior could be categorized as

i. Primary or direct producers of behavior
ii. Secondary or indirect producers of behavior

. The glands secreting the primary producers of behavior are gonads ,placenta ,adrenal glands ,thyroid and the pituitary.Hormone secreted by the parathyroid ,pancreas,and gastro intestinal mucosa do not have obvious direct influence on behavioral acts and could be designated as secondary or indirect producers of the behavior .

The influence of hormone on the central nervous system and consequently behavior comes from an experiment conducted on cats who were given injection of radioactively marked oestrogen ,which produced sexual behavior after six dasy ,the inbetween observation revealed that marked oestrogen was located within few hours of injection in some part of the brain from where it gradually disappeared. It was assumed that oestrogen first induced the formation of messenger substance and a sufficient amount of this intermediate substance could evoke sexual behavior.various hormonal system have

influence over behavioral pattern but before that it must be understood that the distinction is not so clear ,the hormonal system influence one another depending largely on feedback mechanism and their functions are interdependent ,interwoven.

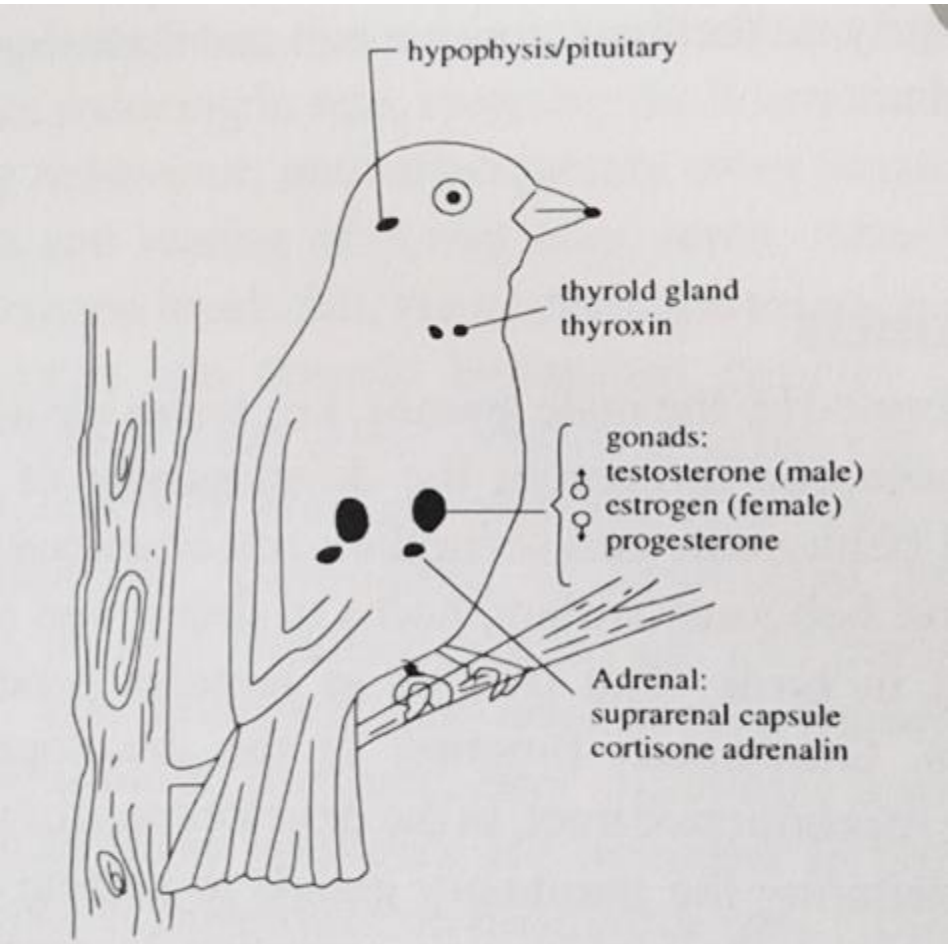
Hormone Of Gonads :

The primary hormones secreted by the male gonads,i.e. testes are androgens,e.e., testosterone..this hormone influences the development of the male reproductive tract ,sexual behavior ,and secondary sex characterstics like big sized mane in lions and baboons ;antlers ;horns in deers ,and antelops; plumage and coloration in birds .the ovaries in females produced both oestrogen and progestins.oestrogen functions in the development and maintenance of the females reproductive tract,in the development of sexual characterstics ,in stimulating the mammary glands to secrete milk,and in regulating sexual behavior .progestins are important in preparing the uterus for the implantation of fertilized ova and in maintaining pregnancy .

Hormones of Adrenal Glands

The medulla and cortex of the adrenal gland secrete different hormones having different function. the medulla secrete epinephrine norepinephrine, both function in emergency situation like catching the prey or running away from predator .Epinephrine increases pulse rate and blood pressure ,yo cope up with situation like fleeing from danger and mating .norepinephrine functions as a transmitter in the synapses ,their disfunction can lead to delayed or excessive reaction and subsequently it will show in behavior also ,Adrenal hormone are useful in emotional and physical stress ,e.g., rescuing fledglings from raptors and snakes, and escaping harsh climatic condition .the adrenal cortex secretes at least 28 different steroid hormones which is metabolism and resistance to infection and also give a feeling of general well being .

Any small abnormality in metabolism in metabolism of carbohydrates or maintenance or mineral level can lead to big impairment and abnormal individuals, and subsequently abnormal behavior ,for example ,if in some animal salt metabolism is disturbed ,it would spend hours licking salt or drinking excess of water .the adrenal cortex also secretes both maole and female gonadocorticoids,these are mainly androgens and small quantity of oestrogen .the adrenogenital syndrome usually refers to a group of enzyme deficiency that block the synthesis of gonadocorticoid ,for compensation the anterior pituitary secretes more ACTH and hence ,increased amounts of androgen as well ,thereby causing masculinization ,female suffering with this syndrome would develop beard ,deep voice ,hairy body,male sexual desire ,and male like behavior .



Main endocrine glands found in a vertebrate

Hormones of Pituitary

The puitary glands can be divided into three lobes,anterior,intermediate ,and posterior .The hormones produced by anterior pituitary influence the production of hormones produced by other endocrine glands,all of which control behavior in osme or the other forms ,therefore ,anterior pituitary has indirect control over many behavioral patterns.the Somato trophic hormone (STH) or growth hormone stimulates growth and protien anabolism ,any abnormality will show lead to gross physiological or morpholical malfunction and later .it will show it show its manifestions on behavior .

Any abnormality in the production of hormones can lead to abnormal indviduals and abnormal behavior,may it be form the category of primary or secondary producers of behavior.disoerders of endocrine system can involve hypersecretion (underproduction) or hypersecretion (overproduction) of hormones .if growth hormone is hyposecreted during the growth years,the normal height is not attained ,this condition is called **pituitary dwarfism;** opposite to hyper seccretion will result in giantism ,in which excess of height

is attained .hypersecretion of thyroid hormones during growth years result in cretinism which causes dwarfism and mental retardation and the effect of both these symptoms on behvior very adversly .thyroid stimulation homrone (TSH) controls the production of thyroxin from thyroxin from thyroid .this hormones controls metamorphosis in animals.iodine deficiency in water causes less production of thyroxin in Axolotl.larva and it delays metamorphosis of larva into adult Ambystoma Salamander.the Axolotl larva keeps increasing in size ,develops gonads ,and starts showing reproductive behavior .

Survey of Hormonal Effect on Different Behavioral Patterns

Sexual Behavior : the role of hormones in controlling sexual bahavior has been most extensivley studied .in the experiment .it was observed that a capon (a cock whose testes are removed)could neither crow nor show any courtship behavior due to lack of male hormones . on the other hand ,female duck whose ovary was removed ceased to perform the typical movement patterns of inviting the partner to mate .All these lost characters reappeared,if castrated (removal of testes and /or ovaries)animal were given the missing sex hormones by artificial means .in male parakeets ,the sex hormones regulate their loud singing and their courtship behavior .

Eversole(1941) studied that injection of testossterone into immature male guppies produces normal mature sexual behavior .the sexual behavior is not manifested in young animals.if a chik is treated with testosterone ,he may be seen mounting small objects in the case. In one grasshopper species ,female allow copulation only when under the influence of a hormone secreted from corpora allata ,without this hormone they would send away all males .the male desert locust also do not elicit sexual behavior ,if their corpora allata have been surgically removed .in male cockroaches ,the copulation movements are dependent upon a hormone produced by corpora cardiaca **.**

Aggressive Behavior :there are still areas of social behavior more or less under the influence of hormone action .aggressive behavior is affected by a considerable variety of hormone action .aggressive behavior is affected by a considerable variety of hormones from both the pituitary gonadal system and the pituitary adrenal system .in red belted waver bird ,lutenising hormones from the pituitary gland has been demonstration to play a role in the control of aggressive behavior .since is most species ,the male are far more aggressive than female,it may be well-assumed that testosterone plays a significant part in the aggressive behavior**. .**

Maternal Behavior : in doves ,progesterone secretion is important for the start of

incubation .if the level are low,the females will cease to sit over their eggs .in hen too ,prolactin initiates incubation behavior in few birds like phalarops and dotterel,it has been found that females secrete more testosterone than males ,hence it is the famale who is brightly colored who fights with other females,courts the dull colred male and having laid eggs in the nest which the male has built ,leaves him to incubate and raise the young .for the release of appropriate behavior ,the hormones should be present in proper amount nd ratio,nesting building behavior in female rabbit is triggered,if the ratio between oestrogen and progesterones is 1:4000,if the ratio is changed ,the female will caease to build brood nests .

Bock and baggerman reported complete absence of nest building behavior following castration in the tree spined stcikleback male .paradise fish will build their typucal bubble nests only when the pituitary hormone prolactin is present .Doves feed their young on milk produced as a secretion from the walls of crop and for the milk to be produced .prolactin from the pituitary must circulate in the world show a similar level of maternal responses .therefore,there remain certain question which warrant further investigation .

Method of study : enthoendocrinological research employs following method to study the role of hormones in controlling behavior :

Correlation Method: in the field of science ,basically all method are correlation method ,an experiment is performed ,the result are obtained ,and a correlation is derived ,but here correlation method means forms the basis of all other method ;in earlier years ,when sophisticated instruments and techniques were not available ,this was the method which gave informationa for future method .this was the easiest method for studying horones and behavior .this case ,one simply searches fluctuations or differences in behavior which can be due to parallel hormonal fuctuation .

Castration and replacement :More direct evidence of a hormone regulation of behavior can be studied through use of the method of castration and replacement .with castration one removes the source of a hormone .if a behavioral pattern is hormone dependent ,it should show a decrease with decrease in hormone.if one replaces the hormone,behavior should reappear.instead of operative castration ,it is now possible to castrate chemically by using anti-androgen or by exposing testes to highly concentrated x rays.oophorectomised ducks cannot perform species specific courtship movement to invite males.but can resume all the lost activities when given female sex hormones.

Cannulation:Hormone have been found to effect behavior through effects on numerous specific brain structures .to study this particular correlation ,metal cannula is inserted in the

exact palce with the help of brain maps and the hormone is poured through it to study the behavior .Barfield (1971) cannulated testosterone into the brain of castration male ring doves,he found that proptic area of the hypotalamus was responsible for the sexual and aggressive behavior in these birds.

Hormone uptake Method:Autoradiography,a procedure in which hormones are labelled with radioactive substance , can be used to determine the brain region in which hormones are concentrated .if labelled hormones are injected into the animal ,their location in the brain can be detected later by using radio sensitive plates over the section of brain .

Cross Transfusion : Tokel and Rosen Blatt (1972)developed a technique wherby blood could be crossed transfused between mother female and virgin females .it was found that the blood from mother female was effective in including maternal behavior in virgins.

Antihormone Method : Various drugs are available that have been shown to function as anti hormones.Both antiandrogen and anti oestrogen drugs have been used in this types of studies .when an antihormone is given to an animal ,it blocks the functioning of a perticular hormone and simultaneously ,the naimal shows the absence of a particular behavior.

Hormone Assay Method : one of the most promising development in the study of hormone action is the use of refined chemical assay methods to measure the hormone content of the blood directly.direct hormone assay helps to associate changes in the body's normal secretion with changes in behavior .Hormone assay work has already yielded some fascinating results.

Conclusion : Various Hormone such as hormone of gonads and pituitary are found in the body that alters the both sexual behavior and behavioral pattern of the orgsnism .naturalists have applied variosu method to study these changes in behavior .Enviromental factors such as season and temperature also effect or play vital role in the change of behavior .

References:

1. www.animal**behavior**online.com/1A.html
2. http://en.wikibooks.org/wiki/Animal_Behavior/Hormones_in_Behavior
3. Minerva Endocrinol. 1997 Jun;22(2):37-43.
4. Data base system of Animal Behavior /hormone /chapter 19-20Animal Behaviour (Ethology) By V K Agarwal

Medicinal Plant - Tinospora Cordifolia

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Abstract

Tinospora cordifolia also called giloy is an important medicinal plant as well as drug in indian system of medicine. it contains a huge number of phytochemicals which are responcible for its antimicrobial and antifungal activity. Basically it is a herb which is used to cure from various infections and diseases i.e urinary tract infections, gastrointestinal disorders, respiratory disease, cutaneous infections. debility, dyspepsia, fever, stomachic , diuretic, bile secretion stimulation, constipation, allays thirst, burning sensation, vomiting, jaundice and skin diseases etc. In this review we are discussed about Tinospora cordifolia and its medicinal properties.

Introduction

inospora cordifolia is commonly known as Guduchi, Gllow, Tippa-teega, Shindilakodi, Amruthu, Chittamruthu,Amrutha balli, bândaul pich. Rasakinda, boraphét, geloy, guruc, gurcha, galac, garo, Amritavalli, amrta, cinnodbhava, Guduchi, gulvel, Guluchi, Gurjo etc. (Kumar *e tal* 2017) is an important drug of Indian system of medicine. The drug is used to cure from urinary tract infections, gastrointestinal disorders, respiratory disease, cutaneous infections. debility, dyspepsia, fever, stomachic , diuretic, bile secretion stimulation, constipation, allays thirst, burning sensation, vomiting, jaundice and skin diseases. The root and stem of T. cordifolia are prescribed in combination with other drugs as an anti-dote to snake bite (Singla and Singla 2010; Manandhar *et al* 2019). The pharmaceutical significance of this shrub is mainly due to presence of various bioactive compounds in it for example glucoside, alkanoidal constituents including berberine, three fatty alcohol, gilonin (Panday *et al* 2012) diterpenoid, lactones,steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides

(Meshram *et al* 2013) Flavonoids, glycosides, saponins and a small amount of phytosterols (Onkar *et al* 2012). This herb has high iron concentration which helps in improvement of blood profiles for iron (Geeta and Sharda 2013).

Botanical Discription of Tinospora Cardifolia and its Distribution all over World

Basically it is an herbaceous vine which belongs to Kingdom: Plantae. Division: Magnoliophyta. Class: Magnoliopsida. Order: Ranunculales. Family: Menispermaceae. Genus: Tinospora and Species: T. cordifolia. It is normally found in deciduous and dry forests of India, Myanmar, Sri Lanka, China, Thailand, Philippines, Indonesia, Malaysia, Borneo, Vietnam, Bangladesh, North Africa, West Africa, and South Africa at elevations up to 1000ft (Pendse VK *et al* 1981; Singh j *et al* 2003, Mia MMK *et al* 2009 and Jain S *et al* 2010). The plant is a glabrous climbing shrub having heart shaped leaves,yellow coloured flowers and drupes fruits (which turned into red colour after riped./upon ripeing they are turned into red colour) (Kumar D V *et al* 2017).

Phytochemical Composition Of Tinospora Cardofolia

Tinospora cordifolia effective against a large number of microorganisms because it contains a huge number of phytochemical compounds. These compounds are found almost in all parts of plant but high concentration of these compounds found mainly in the stem, leaves and roots of the plant (Sinha *et al* 2004). Sharma *et al* (2012) and Jamal *et al* (2016) reported that main compounds of *Tinospora cordifolia* are berberine, furanolactone,tinosporone, tinosporic acid, cordifolisides A-E, giloin, gilenin, crude giloininand, tinosporide, columbin, chasmanthin, palmarin, palmatosides C and F, amritosides, cordioside, tinosponone, ecdysterone, makisterone A, hydroxyecdysone, magnoflorine, tembetarine, arabinogalactan polysaccharide, picrotene, bergenin, gilosterol, tinosporol, tinosporidine, sitosterol, cordifol, heptacosanol, octacosonal, syringine, glucan polysaccharide, syringine apiosylglycoside, isocolumbin, palmatine, tetrahydropalmaitine, jatrorrhizine and reducing sugar (Sandhu *et al*. 2013).

Nutritive Composition of Tinospora cordifolia

T. cordifolia contains 15.9 % high fibre, 4.5%-11.2% sufficient protein, 61.66% sufficient carbohydrate and 3.1% of fat . It contains 292.54 calories per 100 g. It also contains various elements Such as 0.845% potassium, 0.006% chromium, 0.28% iron and 0.131%

calcium which are important in regulatory functions (Nile and Khobragade 2009).

Antimicrobial Activity of Tinospora Cardifolia

By combining with different types of solvents Tinospora cardifolia shows antimicrobial activity .for example Ethanolic extract of tinospora cardifolia shows significant effect against *Bacillus subtilis , Enterococcus faecalis , Trichophyton simii , Trichophyton rubrum 57 and Trichophyton rubrum* 296 (Veeramuthu *et al* 2010; Duraipandiyan *et al* 2012) *Staphylococcus aureus (MTCC No.87), Proteus vulgaris (MTCC No.742), Pseudomonas aeruginosa (MTCC No.424), Bacillus subtilis (MTCC No.441), Staphylococcus epidermidis (MTCC No.9041), and Micrococcus luteus (MTCC No.106*) (Mishra *et al* 2014). Ethanolic extract of tinospora cordifolia along with Ocimum sanctum and Piper nigrum is also effective against *Staphylococcus aureus* (Debnath *et al* 2014). *Escherichia coli* (Shanthi and Nelson 2013) *Salmonella typhi (Gram-negative), Serratia marcesenses* (Gram-positive) (Jeyachandran *et al* 2003). Methanolic extract of tinospora cardifolia shows significant effect against *Streptococcus mutans, Enterococcus faecalis and staphylococcus aureus* (Kunjal *et al* 2014) *Bacillus subtilis, E.coli, Pseudomonas fluorescens, Staphylococcus aureus and Xanthomonas axonopodis pv. malvacearum and also shows antifungal activity against Aspergillus flavus, D reschlera turcica and Fusarium verticillioides* Mahesh and Satish, 2008 *Staphylococcus albus bacteria* (Verma and Kakkar 2009). Hydromethanolic solvent containing extract of tinospora cardifolia shows antimicrobial activity against *Staphylococcus aureus (2mm), Bacillus subtilis (3mm), Micrococcus luteus (2mm), Staphylococcus epidermidis (4mm)* (Mishra *et al* 2014) *Sarcina lutea* (Hossain *et al* 2013). Aqueous extract of tinospora cardifolia shows significant effect against *Salmonella typhi* and *Escherichia coli* (Khan *et al* 2011) *Psuedomonas aeuruginosa and Staphylococcus aureus (*Venkanna *et al* 2012) *Klebsiella pneumoniae, Proteus vulgaris* (Shanthi and Nelson 2013) *Enterobacter faecalis, Serratia marcesenses* (Jeyachandran *et al* 2003). Chloroform extract shows significant effect against *Escherichia coli, Psuedomonas aeuruginosa and Staphylococcus aureus (*Venkanna *et al* 2012) *Klebsiella pneumoniae, Proteus vulgaris* (Shanthi and Nelson 2013) Chloroform extract of tinospora cordifolia in combination with *Ocimum sanctum, Piper nigrum effective against E. coli (*Debnath *et al* 2014) *Enterobacter faecalis, Salmonella typhi (Gram-negative), Staphylococcus aureus and Serratia marcesenses* (Gram-positive)(Jeyachandran *et al* 2003). Petroleum spirit, dichloromethane and Ethyl acetate extract shows antimicrobial activity against *Sarcina lutea, E.coli and Bacillus subtilis* (Hossain *et al* 2013). *Tinospora cordifolia* and chlorhexidene also have antibacterial and antifungal effectiveness

and it can be used as an adjuvant to oral hygiene practice, especially in case of AIDS patients who are more prone to opportunistic infections (Peter *et al* 2014). An extract of tinospora cardifolia chlorhexidine is also effected against Streptococcus mutans (Agarwal *et al* 2020).

Conclusion

The emergence of new infectious diseases are of great concern to global health community. Effective treatment of such infectious diseases entails formation and development of new biomedicines. So Commonly used medicinal plant i.e Tinospora cordifolia which contains berberine, furanolactone,tinosporone, tinosporic acid, cordifolisides A-E, giloin, gilenin, crude giloininand, tinosporide, columbin, chasmanthin, palmarin, palmatosides C and F, amritosides, cordioside, tinosponone, ecdysterone, makisterone A, hydroxyecdysone, magnoflorine, tembetarine, arabinogalactan polysaccharide, picrotene, bergenin, gilosterol, tinosporol, tinosporidine, sitosterol, cordifol, heptacosanol, octacosonal, syringine, glucan polysaccharide, syringine apiosylglycoside, isocolumbin, palmatine, tetrahydropalmaitine, jatrorrhizine and reducing sugar could be an excellent source of drugs to prevent this problem.

Refrences

1) Agarwal S, Ramamurthy PH, Fernandes B, Rath A, Sidhu P. Assessment of antimicrobial activity of different concentrations of Tinospora cordifolia against Streptococcus mutans: An in vitro study. Dent Res J 2019;16:24-8.

2) Dr. K Geeta, Dr. Kumari Sharda 2013 Nutritional Evaluation of Giloe (Tinospora cordifolia) Extract Incorporated Energy Dense Food Products. INDIAN JOURNAL OF RESEARCH. Volume : 2 | Issue : 9 page 41-43.

3) Pendse VK, Mahavir MM, Khanna KC and Somani SK. Antiinflammatory and related activity of Tinospora cordifolia (Neem giloe). Indian drugs 1981; 19: 14-71.

4) Singh J, Sinha K, Sharma A, Mishra NP and Khanuja SP. Traditional uses of Tinospora cordifolia (Guduchi) J Med Aromat plant Sci 2003; 25: 748-51.

5) Mia MMK, Kadir MF, Hossan MS and Rahmatullah M. Medicinal plants of the Garo tribe inhabiting the Madhupur forest region of Bangladesh. 2009.

6) Jain S, Sherlekar B and Barik R. Evaluation of antioxidant potential of Tinospora cordifolia and Tinospora sinensis Int J Pharm Sci Res 2010; 1:11; 122-8.

7) Panday, SP, Chikara SK, Vyas MK, Sharma R, Thakur GS and Bisen PS. 2012. Tinospora cordiofolia : A Climbing Shrub in Health care Management; Vol.3(4), 612-

628.

8) Meshram A, Bhagyawant SS, Gautam S and Shrivastava N, (2013).Potential Role of Tinospora cordifolia in Pharmaceuticals. World J. Pharm.Sci., 2(6): 4615-4625.

9) Onkar P, Bangar J and Karodi R, (2012). Evaluation of Antioxidant activity of traditional formulation Giloysatvas and hydroalcoholic extract of the Curculigoorchioidesgaertn. J. App. Pharma. Sci, 2(6): 209-213.

10) Singla A, Singla A P (2010) .Review Of Biological Activities Of *" Tinospora Cordifolia. Webmed Central PHARMACEUTICAL SCIENCES* 1(9): 1-13.

11) Jamal A, Abdul R K, Mohammad K A (2016). Phytochemical, antioxidant and antiproliferative studies of some medicinal plants from indian sub– continent. *Britisj Journal of Pharmaceutical Research*. 11(6):1–11.

12) Kumar D V, Geethanjali B, Avinash K O, Kumar J R, Chandrashekrappa G K, Basalingappa K M (2017). Tinospora cordifolia: the antimicrobial property of the leaves of amruthaballi. *Journal of Bacteriology & Mycology* 5(5):363–371.

13) Sinha K, Mishra N P, Singh J(2004). Tinospora cordifolia (Guduchi), a reservoir plant for therapeutic applications: A review. *Indian Journal of Traditional Knowledge.* 3(3): 257–270.

14) Sharma U, Bala M, Kumar N (2012). Immunomodulatory active compounds from Tinospora cordifolia. *J Ethanopharmacol.* 141(3): 318–926

15) Manandhar S, Luitel S, Dahal R K (2019). In Vitro Antimicrobial Activity of Some Medicinal Plants against Human Pathogenic Bacteria. *Hindawi Journal of Tropical Medicine* 2019: 1-6.

16) Khan, A, Prakash ,R, Ali ,S, Aljarbou ,A and Khan ,M (2011). *Comparative Study of Antibacterial Activity and Toxicity of Certain Plants used in Unani Medicine* . Advances in bioresearch (Volume 2, Issue 2, 10 – 13.)

17) Sandhu ,A, bhardwaj ,N, Gupta ,R and Menon ,V (2014). *Antimicrobial activity and photochemical screening of tinospora cordifolia and euphorbia hirta . International Journal of Applied Biology and Pharmaceutical Technology ournal of Advanced Pharmacy Education & Research.* (volume 4 issue 3.441-449).

18) Debnath ,M , Khandelwal ,M, Lal, P , Jain, R (2014) . *Evaluation of Heavy Metal Distribution and Antibacterial Activities of Medicinal Plants Tinospora cordifolia, Ocimum sanctum and Piper nigrum . International Journal of Pharmaceutical Sciences*

and Drug Research (6(3): 229-234).

19) Hossain Md. ,S, khatun, T, Hassan, M.M (2013) *invitro antibacterial effect of Tinospora cordifolia extracts against some selective bacterial pathogens . International Journal of Biosciences* (Vol. 3, No. 7, 156-161)

20) Duraipandiyan ,V, Ignacimuthu ,S , Balakrishna ,K, (2012).*Antimicrobial activity of Tinospora Cordifolia: an ethnomedicinal plant* ntimicrobial activity of Tinospora cordifolia . *Asian Journal of Traditional Medicines*, (2012, 7(2).

21) Shanthi ,V and Nelson ,R (2014*). Anitbacterial activity of Tinospora cordifolia (Willd) Hook.F.Thoms on urinary tract pathogens. International journal of current Microbiology and applied science* (Volume 2 Number 6 . 190-194)

22) Verma ,D.R and Kakkar, A (2009).*antibacterial activity of tinospora cordifolia* Journal of Global Pharma Technology Available. (3(11): 08-12)

23) Mahesh ,B and Satish ,S (2008).*Antimicrobial Activity of Some Important Medicinal Plant Against Plant and Human Pathogens*. World Journal of Agricultural Sciences (4 (S): 839-843)

24) Peter Dr. T, Dr.Hegde ,V, Dr. George, R.M and Dr. Aluckal, E (2014*). Effectiveness of tinospora cardifolia on staphylococcus, streptococcus, klebsiella and candida species among hiv infected children - a randomised control trial. World Journal of Pharmaceutical Research* (Volume 3, Issue 5, 1290-1298).

25) Nile SH and Khobragade CNN. Determination of nutritive value and mineral elements of some important medicinal plants from western part of India. J Med Plants 2009; 8:5; 79-88. 26

Organic Farming

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Organic farming

The term of organic farming is not new for the farmers. The method of organic farming has been adopted from centuries for the cultivation of crops due to their diverse climatic conditions. Ten thousand years ago
the ancient civilization start farming by adopting the methods of organic farming. The cultivation of natural herbs and medicinal plants in the forest and wilderness is also in the same category. The method of organic farming among all the other farming practices is becoming special focus of the agricultural scientists now days. The main reason for adopting organic farming is to minimize the use of artificial fertilizers, pesticides, weedicides and other agricultural chemicals. In fact, it not only saves money but also protects the environment, land fertility, increased employment opportunities on long term basis. For the many of the organic concept came and one is zero budget natural farming by Mr. Subhash Palekar.

Zero Budget Natural Farming, Mr. Palekar and his vision

Mr. Subhash Palekar studied natural system and verified natural processes of the forest on his farm for six year, since 1989 to 1995. There were about 154 research projects during these six years of research work. After six years of verified research work, he got the package of technique about Zero Budget Natural Farming; which he is giving to the farmers throughout India. He (Krishi ka Rishi) also awarded by many awards some are:

BASAVA SHRI AWARD (2005) GOPAL GAURAV AWARD (2007) PADMA SHRI (2016)

This model eliminates the cost of fertilizers, pesticides and seeds and greatly reduces the incentive to borrow, one of the chief causes for farmer suicides in the country.

Definition of Zero Budget Natural Farming (ZBNF)

Zero Budget Natural Farming (ZBNF) or holistic agriculture is a method of agriculture that counters the commercial expenditure and things required for the growth of plant are present around the root zone. In the Zero Budget Natural Farming nothing has to be purchased from the outside. All things required for the growth of the plant are available around the root zone of the plants. 98 to 98.5% nutrients are taken from air, water & solar energy. Remaining 1.5% nutrients taken from the soil are also available free of cost as it is taken from the prosperous soil which is enriched with these nutrients.

WHY ZBNF?

- An approach towards sustainability
- Expense-free farming
- Farming up to 30 acres with one native cow
- Farming with minimum electricity and water consumption
- Producing quality, poison-free food
- Agriculture without external input
- Techniques of multi-crop cultivation for higher net income
- Reducing external labor requirement
- Farming in tune with nature
- Saving the farmers from suicide themselves and leaving behind their families as beggars.

Despite all these things there is contradiction between the people that promote organic farming and the people that don't promote the use of organic farming? Due to increased use of inorganic fertilizers now people feel fear in using organic fertilizers as these are slow in providing nutrients. That's why so many questions arise related to the nutrition and reliability of these organic fertilizers. Some of these questions are listed below:

- Can we provide enough food for everyone through organic farming?
- Is it possible to fulfill the nutritional needs of crops from organic sources?
- What are the environmental benefits of organic farming?
- Is the quality of the food produced by organic farming is good?
- Is organic farming economically beneficial?
- Is the control of diseases caused by insect pest possible through organic farming?

The yield from organic farming may be less than the yield from conventional farming systems but it's not same for each crops some of the crops yields much better than that of conventional farming, during drought the production of organic crops is much higher. Due to green revolution, per acre yield remains almost same even through the adaptation of organic farming in the areas where irrigation facilities are available. Traditionally in arid regions the inputs mostly used in small amounts. So the production through organic farming gives better results.

Organic farming (ZBNF) and food security

To provide sufficient amount of good quality food to the human beings and animals different management techniques including balanced fertilizer, crop rotation, crop residues recycling, good quality irrigation water and use of good quality seeds should be adopted. During croprotation leguminous crops should be preferred than other crops. It is normally believed that by the use of organic farming the production will be reduced fiercely. However it is not proved practically. Studies have shown that while moving from conventional farming toward organic farming the demand and supply of the food will not be affected. However its effect on exports depends upon the crop quality. But later on the production of most of the crops get better in yield and quality.

Nutritional management in organic farming (ZBNF)

The organic farming critics say that the fertility and productivity of soil cannot be improved by the addition of organic manures because the availability of organic resources is limited. But due to climatic change and soil constraints the use of organic manures is useful than inorganic fertilizers. In organic

farming the availability of nitrogen from organic sources sometimes lowers the production of edible commodities. In limited water conditions or in arid areas the difference between production through organic farming and conventional farming remains only about 10-15% per acre.

Rearing of animals is an old tradition and is helpful in organic farming. Because the animals eat plant residues and other fodder crops growing on the soil and their waste material is used as an organic fertilizer and ensures the improvement in soil fertility. Dairy farming played a significant role in improving the financial situations of the poor farmers. Farmers can collect these organic manures but do not store properly that's why 40-60% of the nutrients especially nitrogen lost. In organic farming these losses can be minimized through composting and vermi composting. One gram of desi cow dung contains 300 to 500 crores of beneficial effective microbes.These micro- organisms decompose the dried biomass on the soil and make available the nutrients to the plants. All Indian cow breeds are suitable for ZBNF. Dung and urine from one desi cow is sufficient to cultivate 30 acres of land in ZBNF.

Economic aspects of organic farming (ZBNF)

In organic farming very small amount of inputs is needed to purchase. Organic fertilizers and insecticides can be prepared from animal wastes and locally available trees and grasses. Biological and mechanical methods are adopted for insect control. The use of available resources as inputs decreases the cost. Sometimes it is seen that cost in organic farming can increases due to the purchase of organic fertilizers but this gap can be controlled due to high costs of the products.

What farmer wants…..?

They want good green crop and high yield but what about ENVIRONMENT? By managing the organic farming through cultural practices we can achieve both economic and environmental benefits. Organic farming provides environmental protection, increase in biodiversity, energy use and reduction in carbon dioxide emission in developed countries. While in developing countries it increases per acre production at low cost, increase

biodiversity and also environmental protection.

Palekar's Principles of ZBNF to overcome from farmer's problems

1. Low Input farming:

The production cost for the farmer is zero as no input needs to be purchased.

As 1.5 to 2% of the nutrients are taken from the soil by the plant, there is no need to add fertilizers. These nutrients provided by nature (as in the forest) are totally free of cost.

2. Natural input

Natural farming does not require chemicals inputs or organic compost like vermiculture (S. Palekar considers these external inputs as destructive as chemicals) but promotes a natural catalyst of biological activity in the soil and natural protection from diseases.

3. Soil mulching

It is necessary to create the micro-climate under which micro-organisms can well develop, that is 25 to 32 °C temperature, 65 to 72 % moisture. It creates darkness and warmth in the soil. It conserves humidity of the soil, cools it and protects its micro-organisms. Mulching promotes humus formation, suppresses weeds and maintains the water requirement of crops.

4. Multicropping

Multicropping is a good way to minimize the risks for the farmer who is able to enjoy continuity of yield throughout the year. In case of a crop's failure he can also rely on the other crops. It has expanded farmers' income sources.

The arid and dry regions where land is barren for many years but social, economic, and environmental factors are favorable. There is a possibility of success in organic farming. So the lands of arid region can be brought under cultivation immediately without any potential risk of lack of production.

Application of ZBNF towards Low Input and High Yield Crop

1. Role of Jeevamrita

Soil is saturated with all the nutrients, but these are in the unavailable form to the roots of the plants. Beneficial microorganism in Jeevamrita converts the nutrient in non available form into dissolved form, when it is inoculated to the soil. Jeevamrita is either sprayed/sprinkled on the crop field or added to the irrigation tank in regular interval of 15 days until the soil is enriched.

2. Role of Beejamrut

Naturally occurring beneficial microorganisms are found in cow dung.These microorgani sms are cultured in the form of beejamrut and applied to the seeds as inoculms. It

is reported that seed treatment with beejamrut protects the crop from harmful soilborne pathogens and also helpful in producing IAA and GA3.

3. Insect-Pest Management in ZBNF

- Allowing for an acceptable level of pest damage.
- Encouraging predatory beneficial insects to control pests.
- Encouraging beneficial insects and microorganisms by serving them nursery plants and/or an alternative habitat, usually in a form of a shelterbelt or hedge row.
- Careful crop selection, choosing disease-resistant varieties.
- Companion crops that discourage or divert pests.
- Row covers to protect crops during pest migration periods
- Pest regulating plants and ecologic pesticides and herbicides
- no-till farming, and no-till farming techniques as false seedbeds
- crop rotation to different locations from year to year

Conclusion

Savings on cost of seeds, fertilizers and plant protection chemicals has been substantial because of continuous incorporation of organic residues and replenishment of soil fertility. Help to maintain the soil health. The new system of farming has freed the farmers from the debt trap and it has instilled in them a renewed sense of confidence to make farming an economically viable venture.Pest management is a key component in zero budget natural farming crop production systems.To successfully control pest in a zero budget natural farming, it is important to understand the interactions of different components in a specific ecosystem.

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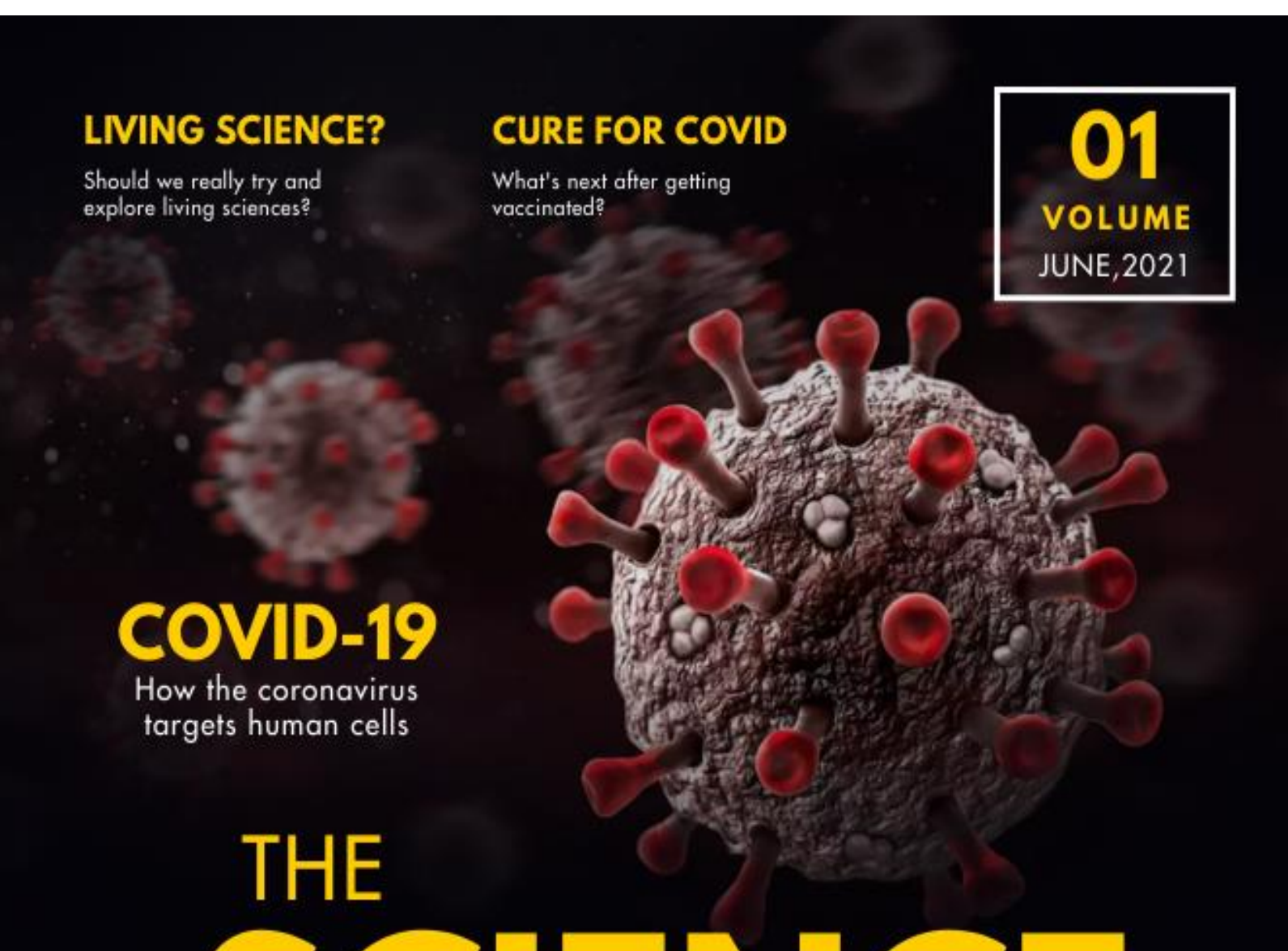

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