

## Documentation of Indigenous Traditional Knowledge (ITKs) system prevalent among poultry farmers of Palakkad district, Kerala

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A number of communities, most of which have distinctive long-established knowledge and know-how base, populate Kerala state. Indigenous technological knowledge can be encouraged through a scientific approach as one of the means of sustainable agricultural practices, which will be environment-friendly. ITK that are in practice all over rural India is little acknowledged and there is a threat of loss of this knowledge. Hence some of the local knowledge and technologies were studied and the importance of the same has been evaluated. The study was carried out within the scaffold of poultry farming and allied activities. A broad range of varied sectors including poultry housing, feeding and disease management were taken into account for the purpose of the study. It is observed from the study that farmers adopt traditional knowledge in every aspects of poultry farming including housing, brooding, feeding management, hatching process, seasonal management, poultry health management etc. The documented ITKs showed the richness of the time-tested traditional knowledge applied to animal husbandry in the region specified under the study.

**Keywords:** Broiler farming, Layer farming, Poultry diseases, Poultry feeding, Poultry housing, Summer stress

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ITK refers to indigenous technical knowledge and otherwise as, traditional knowledge and ancient knowledge etc. Indigenous technical knowledge is the knowledge limited to a small area or community, passed through generations to unravel certain issues taking account of locally existing factors. These traditional knowledge and technologies have done a major part in the socio-economic progress of the rural communities.

One of the huge challenges in front of the humankind over next few decades is to safeguard its natural resources, producing enough food to meet the demands of a rising population. The field studies suggest that the only way to formulate technology appropriate and adaptable to a farmer's resource base is by analyzing the socio-economic and biophysical constraints of farm production.

Kerala is a state with rich crops and livestock biodiversity including number of indigenous, crossbred and exotic poultry breeds. The farmers of this state have been practicing diverse locally adapted traditional knowledge of poultry management for

years. It is appropriate to document these practices and to assess their soundness. A proper association between traditional and modern knowledge systems has massive potential to help society. The present study aimed to assess the scientific traditional knowledge of poultry farming and related sectors to pick up appropriate ITK for sustainable agriculture. The study will help to disseminate the ITKs among farmers so that this traditional knowledge will be passed to the younger farming community.

### Methodology

The study was carried out within the outline of poultry rearing systems in the Palakkad district of Kerala in August –September months of 2018. The ITKs were documented through interaction and discussion with farmers of the study area. The qualitative nature of the study necessitated the use of interactive research methods such as focus group discussions and field observations. This provided the knowledge holders and community members to share their knowledge and experiences on the research problem. Four focus group discussions were conducted with the farmers in Alathur Panchayat, Kuzhalmandam Panchayat, Alanallur Panchayat and

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Kottopadam Panchayat to collect data on layer farming. The study was conducted in agreement with the participants and all the respondents were informed of the focus of the study. The focus group discussions sought to establish the main traditional practices used in chicken rearing, formulations used for health management, and how this knowledge has been acquired or passed on over generations.

The structured interview schedule was prepared and carried out among the layer and broiler farmers and farm supervisors to collect data on various management practices they are following. The farmers were randomly selected from Alanallur Panchayat, Kottopadam Panchayat, Kumaramputhur Panchayat, and Thenkara Panchayat. A total of 50 respondents were selected from these areas and interview was conducted.

## Materials and Methods

The subsequent sectors were taken into account for the purpose of the study.

### Layer farming

In layer farming respondents were from both systems of farming i.e., farmers who are practicing the intensive rearing method (cage and deep litter system) and those who are rearing birds in semi-intensive methods (backyard). The following sectors were studied under layer farming practices i.e., incubation and hatching operations, poultry shed construction, Feeding management, Health and disease management, Stress management, Predator attack.

### Broiler farming

In broiler farming, the farmers are following a commercial intensive system of management. Since they are practicing commercial farming methods, the use of ITK in feeding management is almost nil other than feeding some concoctions which are used for disease prevention.

## Results

### Incubation and hatching operations

Broody hens were commonly used for hatching indigenous and improved crossbreds/varieties of chicken (Gramasree and Gramalakshmi) and duck eggs. Mud pots/ cardboard boxes/ iron pots/wooden boxes were used for hatching purpose with saw dust or paddy straws, wood shavings and rice bran as bedding material (Fig. 1). The eggs were placed horizontally in the pots above the bedding material and the broody hen was made to sit on eggs. About 10-12 duck or poultry eggs were set per broody hen.

Women keep a piece of turmeric in the bedding material to avoid infection to the developing embryos. If farmers wish to make the broody hen come into next cycle of lay without going into abrooding, they are dipped in cool water. Here, the bird is caught by its legs, dipped in water and taken out. This practice is repeated for 4-5 times a day in consecutive 2-3 days.

### Poultry shed construction

The size of backyard housing for chickens depends on the method in which they have to be kept. Erection of poultry sheds on height (approximately 4-6 feet above the ground level) from the earth is a traditional system practiced in backyard farming. Sheds were made up of bamboo or other woods or combination of both wood and iron mesh (Fig. 2). In addition, villagers construct the night shelters in such a way that there will be separate compartments within the pen, which is solely meant for accommodating brooding hen.

### Poultry brooding

Few farmers in the area used to purchase day old chicks from Government hatcheries situated in



Fig. 1 — Types of pots/boxes used for hatching purpose



Fig. 2 — Traditional poultry houses kept in backyard

Palakkad and nearby districts Day old chicks should be brooded to get enough warmth for their growth and survival. In rural areas, where there is scarcity in electricity; farmers use alternate energy sources like wood, coal, and kerosene to generate heat in order to reduce the cost of brooding. Mud pots or large tin boxes are used to accommodate heating materials and holes are put on the sides of these pots/boxes to disseminate heat to the surroundings.

#### **Feeding management**

Feeding practices in backyard rearing is based on scavenging and kitchen waste mainly with small amount of handfed grains in indigenous chicken rearing. Some of the farmers are mixing the feed ingredients like rice bran, coconut cake and cooked rice left over with rice water from the previous day as it will increase the palatability of feed and the rice water act as a good source of energy for birds. This will also help to reduce the feed cost.

Also women keep rice water in bowls as a drinking water source for birds. Farmers will keep the wet coconut thondu (mesocarp of coconut) in dark corners of the scavenging area, which will turn into a termite growth hub, and later this will be provided for the birds to eat, which is a good source of protein.

*Azolla*, an aquatic fern is used as poultry feed by some farmers, especially to caged layers who have less access to green leaves. The farmers opined that it increases the egg production of birds. If birds show pecking among the flock, the farmers use green grass fodders to feed them. The different feeding practices followed among backyard poultry farmers are given in Figure 3.

#### **Health and disease management**

Disease outbreaks are the major challenge of indigenous poultry farming in all areas where poultry rearing is part of integrated farming system. New Castle disease, Coccidiosis, Infectious Bronchitis, fowl cholera/Pasteurellosis, Salmonellosis, Helminthiasis/worm infestation were the common diseases predominantly observed in the areas of study. The common external parasites included mites and fleas. Vices like egg eating, cannibalism etc were seen as management related problems. The decision to take up traditional medicine is backed by past experience in curbing a like conditions and evidence of previous recovery pattern, capital invested and the scale of production.

Depending on the knowledge of the individual farmer, they made use of different plants or single plant

parts to make plant extracts/concoction and applied in treatment of various diseases of backyard poultry. Most of the times, the dose of concoctions to be given were not fixed by farmers and the same preparation, sometimes even at same dosage were given to the adult chickens and also to chicks. Indigenous remedies were sourced locally and included moringa (*Moringa oleifera*), *Aloe vera*, turmeric (*Curcuma longa*), tulsi (*Ocimum tenuiflorum*), garlic (*Allium sativum*), ginger (*Zinger officinale*), black pepper (*Piper nigrum*), lemon juice (*Citrus limon*), asafoetida (*Ferulaaassa-foetida*), shallots (*Allium cepa var. aggregatum*), betel leaves (*Piper betle*), amla (*Embllica officinalis*), curd and many were found to be extensively used to treat various ailments and conditions in layer and broiler chicken.

Focus group discussions showed that the bark, sap, roots, leaves, seeds and flowers of Moringa were used in traditional medicine as they contained nutritive elements that were of health benefit to chickens. Aloe was the most commonly used herb for backyard chicken rearing in the study area. Aloe was used in managing a variety of health conditions as a broad-spectrum medicine in rural poultry rearing. Many farmers used Tulsi for treating respiratory ailments, also concoction of tulsi leaves, pepper and ginger is given in respiratory problems, and to improve the immunity in general.

The study showed that neem is an integral part of indigenous treatment procedures. Various neem products used for treatment of poultry diseases like fowl pox, a wart forming viral disease in poultry. Paste of neem leaves along with turmeric is applied over affected area with fowl pox. Neem oil is sprayed over litter material for fly control in sheds.

Garlic was another traditional medicine given for treating many diseases like New castle disease, worm infestation, respiratory problems and as an immunostimulant (5 – 10 mL of garlic extract per liter of water and used as spray). In the case of fowl pox, farmers usually apply turmeric topically along with neem leaves.

Many farmers use betel leaves for treating gout in broiler chicken. Gout is a common metabolic disease affecting broilers in which uric acid, a metabolite of protein is deposited above the visceral organs and joints of birds. Betel leaves are crushed and juice is added to drinking water. Farmers opined that this gives very good results in managing gout. The juice of banana stem mixed in drinking water is given for treating gout in birds. Even in traditional medication



Fig. 3 — Feeding of kitchen waste, whole grains, azolla, grass to backyard layer flock

for humans, for treating diseases affecting kidneys, people consume banana stem juice.

Shallots/Onion is used to treat fowl pox, especially its dry form. Turmeric, neem and shallots are ground together and the paste is applied over the affected areas. Farmers found it as a very good remedy for treating the cutaneous form or dry form

of pox. Ginger is used to feed poultry to reduce gastric disorders, parasitic load, and as immune stimulant.

Pepper is another spice, which is used along with ginger and tulsi to make concoctions, and the same is given through drinking water for alleviating the difficulties associated with respiratory problems such as

cough, wheezing, rales etc. powdered ginger is given through feed for improving digestion and growth rate.

Also crushed ginger in drinking water, soaked fenugreek seeds, and nutmeg fruit made into a paste are given orally to reduce digestive disorders especially diarrhea in poultry. Mint, Garcinia and *Aloe vera* can be given orally to improve the immunity in poultry.

We could also observe that that ash was used to get rid of ecto-parasites from birds. Some farmers use water that was left after washing fish like sardines as dip in case of external parasite infestation. Lime is topped over the litter spread over the floor @3-4 kg/100 sqft area and raked well in order to reduce the smell associated with ammonia gas released from poultry manure.

The study was also focused on establishing how knowledge was acquired and transmitted to the local community. Seventy percent of the respondents indicated that they acquired the knowledge about the plants, their preparation, application and associated socio-cultural practices through observation and verification from knowledge holders, including parents and community members. Youngsters from the study group opined that they acquired these information both from their elder family members and through the magazines, journals, social media, trainings etc.

The plants/ materials used for treating or managing various poultry disease symptoms are given in Table 1. The way of administration of traditional medicines by farmers are shown in Figure 4.

Table 1 — The plants/ materials used for treating or managing various poultry disease symptoms

Local name	Botanical name	Parts used	Selection of disease symptoms treated	Possible target diseases
Aloe	<i>Aloe barbadensis</i>	Pulp is given through drinking water	Whitish, greenish or bloody Diarrhea	Newcastle disease
Pepper	<i>Piper nigrum</i>	Fruit-dried fruits are powdered and given through feed	Coughing, gasping, noisy breathing	Respiratory diseases
Neem	<i>Azadirachta indica</i>	Leaves, bark	Whitish diarrhea, pox lesions, scaly legs	Viral diseases and external parasites
Banana stem juice	<i>Musa acuminata</i>	Stem was ground in water and given for drinking	White deposits in internal organs, joints	Gout
Betel	<i>Piper betle</i>	Betel leaves in jaggery water for drinking	White deposits in internal organs, joints	Gout
Betel+ pepper		Betel Leaves and pepper fruit –crushed together and given orally	foamy diarrhea, coughing, unthriftiness, drooping wings	Gastrointestinal diseases and worms
Fenugreek	<i>Trigonella foenum-graecum</i>	Fenugreek seeds soaked in water	Diarrhea	Digestive disorders
Garlic	<i>Allium sativum</i>	Crushed cloves in water used as spray	General droopiness, nasal discharges	Viral diseases like new castle disease
Nutmeg	<i>Myristica fragrans</i>	Fruits that are ground in water given orally	White diarrhea	Digestive disorders
Garlic+ pepper		Crushed and given orally	General droopiness, nasal discharges, diarrhea	<i>E.coli</i> infection, Salmonellosis, Digestive disorders
Neem Leaves +Shallots+ Turmeric		Crushed together and applied topically	Wart like lesions on unfeathered area like face, shank, comb and wattle	Fowl pox
Aloe vera/ Nutmeg/ Sodium bicarbonate		Aloe vera juice/ Nutmeg juice/ Sodium bicarbonate in water	Water in abdominal space	Ascitis
Mint, Garcinia, <i>Aloe Vera</i>		Mint juice, garcinia juice in water, neem powder and turmeric powder through feed		For improving general immunity in birds
Neem+ Turmeric+ Salt		Mixed and given orally	General unthriftiness, poor growth, anemia	Intestinal worms
Sardine fish washed water, Ash		Water from Sardine fish wash for dipping and Ash for dusting		External parasites
Lime		For topping and mixing over litter material spread on floor		Foul smell



Fig. 4 — Plants used traditionally by farmers for treatment of various poultry diseases

### Summer stress management

To manage heat stress in birds, broiler farmers keep water soaked jute sacks over the roof of houses and alongside wall wire meshes which will reduce the temperature within the shed. Contemporary to this, in modern poultry houses, sprinklers and foggers are placed in sheds. Also, false roofing is constructed temporarily in the summer season within the shed using locally available coconut leaves or palm leaves. During noon time they sprinkle water over the birds to make them cool.

Also to increase water intake by birds' sodium bicarbonate is given through water. They also add lemon and curd to drinking water to reduce heat stress in birds. Broiler farmers will flush the water retained in the pipeline during noontime when the atmospheric temperature is at its peak so that fresh cool water is filled up in pipelines, which will be taken by birds. Farmers plant shady trees with good canopy along the sides of the sheds to give shade which will reduce heat stress in birds.

### Discussions

Farmers hold a huge amount of traditional knowledge to solve their own problems without resorting to advice from technical people who have

little or very less know-how of local situation. Indigenous knowledge plays a major role in finding location specific solutions for problems based on the micro-climate of farm family, the access to land, available inputs in different times of the year. Careful observations and experience from the past, the farm family, the parents, friends and colleagues, they gather these information on various issues and apply them in need.

Artificial incubation was not at all practiced in hatching operations in small holder backyard farms in villages of Palakkad district even though few commercial large scale farmers use modern hatchery for hatching eggs. The majority of the villagers were rearing the birds in the backyard/free range system but they made necessary provision for night shelter of the birds to protect them from predators i.e., cat, dog and rat. Since sheds are usually constructed at a height above ground level, predator risk is reduced to a great extent.

Separate compartment for broody hen may be in a view that broody hen requires a calm and clean environment for brooding, which will lead to higher hatchability. Also, housing the broody hen with other birds will make the broody hen agitated and it may start pecking at other birds especially younger ones.

Since *Azolla* is rich in protein; it contains around 26-28% protein and also acts as the source of Vitamin A, farmers might have found it as a good feed ingredient for their birds. Some farmers used to feed grass to their birds after making it into small bundles and that will be hung in sheds. Farmers opined that this will invite the attention of birds to leaves and will reduce pecking. But scientifically analyzing the issue, some birds show pecking if their diet is deficient in fiber and providing the grass fodder will increase the fiber content in their diet.

Conventional therapeutic or preventive medicines and vaccines are usually out of reach of the small-scale farmers because of high cost involved coupled with the lack of proper awareness on their use. This makes them to search for locally available cheaper sources for disease management. Since ancient times, different plants and their parts form a requisite source of medicine for indigenous backyard poultry rearing systems. Since these local medical traditions are being communicated orally from generation to generation and are largely undocumented, they are being lost over time. The level of active principles contained in a concoction of plants used as medicines couldn't be analyzed by the farmers hence dosage levels were not known. In most cases, they were offered in drinking water and birds may be receiving overdose or under dose. The unavailability of medicines and lack of veterinary services in the remote rural areas contributed to the use of ITKs by farmers in the treatment of their poultry flock. However, more interventions are needed to validate the scientific rationale behind using this knowledge.

Sharma *et al.*<sup>1</sup>, reported that farmers of southern states of India used to dip birds in cold water to induce moulting or to reduce broodiness which was in accordance with our observation.

A study reported that the Aloe was the most commonly used herb for backyard chicken rearing and demonstrated that *Aloe* could be used to control coccidiosis, in resource-poor smallholder farming areas. Reports showed that smallholder farmers of Zimbabwe use *Aloe vera* and *Aloe spicata* to treat coccidiosis, Newcastle disease and fowl typhoid<sup>2</sup>. *Tulsi* contains oleanolic acid, ursolic acid, rosmarinic acid as active ingredients which help to cure many health problems in poultry.

Neem contains active principles like azadrachtin, salanin, melicin, nimbin etc. and is extensively used in as a herbal medicine in both human and animal

therapies. Neem oil activates macrophage and lymphocytes and thus improves the cell mediated immune response. Many researchers have shown that neem can have many positive effects in poultry like disease prevention, immune stimulation and body weight improvement<sup>3-6</sup>. The anti-protozoal and immunostimulatory properties of neem leaves might have reduced the microbial load and improved the performance<sup>7</sup>.

There are a lot of active components in garlic like Ajoene, s-allyl cysteine, diallylsulphide and the most active Allicine. Garlic has been found to have antibacterial, antioxidant activity and lowers serum cholesterol<sup>8</sup>. In another study done in broiler chicken, garlic has showed to improve growth rate and feed conversion ratio, and decreased mortality rate<sup>9</sup>.

Turmeric powder has been used for improving growth rate in poultry and for immune stimulation in commercial poultry farming. As growth promoter, it is given @ 1 kg/tonne of feed. As turmeric rhizome contains number of bioactive principles like curcumin and its metabolites, it is being used as traditional medicine in both human and animal health management. This polyphenolic compounds has the wide range of biological properties such as antioxidant, antibacterial, antiviral, antifungal, anti-inflammatory, antihypertensive and anti-carcinogenic activities. Turmeric consists of 69.4% carbohydrates, 6.3% protein, 5.1% fat, 3.5% minerals and 13.1% moisture.

Ginger has been reported to contain many active principles which contains volatile oils like borneol, camphene, citral, eucalyptol, linalool, phenllandrene, zingiberine, zingiberol (gingerol, zingirone and shogaol) and resin. Ginger also possesses anti-inflammatory, anthelmintic and antibacterial activities to a certain level.

A study done on broiler chicken fed with ginger in the diet had significantly higher feed intake and feed conversion ability than those on the control diet<sup>10</sup>. Ginger contains nutrients like carbohydrates, lipids, proteins, minerals and vitamins. The secretion of gastrointestinal enzymes including lipase, maltase and disaccharidase are improved after consumption of ginger<sup>11</sup>. There has been many reports stating that the proteolytic and lipolytic enzymes present in ginger as part of natural protective mechanisms improved the performance of birds<sup>11,12</sup>.

Better performance of birds can be attributed to the improvement in digestion due to the enzymatic

activity of ginger and because of its positive effect on gastric juice secretion<sup>13</sup>. In another study, dressing percentage, proportion of cut up parts like breast and thigh weight was increased significantly when fed with extract of ginger roots<sup>14</sup>. Researchers also opined that the active principles in ginger helped to speed up digestion and move contents from GI tract fast, and thus enhanced more feed consumption in birds.

Black pepper has proved its ability to enhance the enzymatic secretions from gastro intestinal tract and pancreas thereby improving digestibility in birds. It also possesses antibacterial and antioxidant properties<sup>15,16</sup>. Another researcher reported that broiler birds fed with 0.1% black pepper oil at 4 weeks of age showed improvement in live weight and weight gain, confirming the importance of black pepper as growth promoting additive<sup>17</sup>.

Many researches show that vitamin C in lemon will help to reduce heat stress in birds. Curd being good source of probiotic agents, will help the birds to withstand heat stress. They also add ice cubes in drinking water to make the water cool.

## Conclusion

Indigenous traditional knowledge are helpful in alleviating poverty among rural communities in several ways by applying locally adapted cost-effective and sustainable agricultural practices<sup>18</sup>. Farmers of Kerala are enriched with indigenous knowledge and technologies that are passed over through generations together in many facets of agricultural and animal husbandry practices. The documented ITKs showed the prosperity of the traditional knowledge applied to poultry rearing in the areas specified under the study. As per the remarks made by the farmers, all the ITKs have been found helpful; they need to be validated scientifically along with the isolation and characterization of active ingredient present in the material employed. Research and development activities under different government schemes should reach these local people and scientific rationale after these indigenous technologies/preparations should be studied for patenting the same. The use of these ITKs may be encouraged as they found to be easily available, cheaper with lesser side effects and can be applied even in remote rural areas. Such traditional practices of farmers are worth validating and exchanging with the other parts of the world also to make farming a sustainable venture.

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## Conflict of Interest

All authors declare that they have no conflicts of interest.

## Author's Contributions

VPG visualized the idea. VPG and STP developed the interview schedule, carried out the survey, did the calculations, and verified the analytical methods. PS helped to prepare and edit the manuscript. All authors discussed the findings and contributed to the final manuscript.

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