IMPROVED ANIMAL PRODUCTION THROUGH RATIONAL LIVESTOCK BREEDING POLICY IN PAKISTAN

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Agriculture sector, with its important component livestock, is considered as most vital part of the national economy since the emergence of Pakistan. However, the development in livestock sector is miserable as compared to progress in crop sector. Livestock is considered as subsistence sector dominated by small holders to fulfill their needs, food and cash income on daily basis. Though a neglected sector yet still plays an important role in national economy and its importance may well be realized from the fact that 35-40 million rural populations is dependent on livestock.

Pakistan has a huge potential in the livestock sector. Coordinated and continuous efforts both in private and public sectors are required to tap the available opportunities for its development. Among livestock sector, dairying is the most important component. Although Pakistan is one of the major milk producing countries, increase in milk production has been achieved mainly through increase in number of animals and not by the increase in per head animal production. So, the demand of milk in the country is not being fulfilled and the milk is going to be an expensive commodity. The most important cause of this situation is the increase in human population (3% annually). Consequently, Pakistan has to import costly dry milk and products which is a burden on national economy. When comparison of milk with major cash crops was made, it was observed that milk had a value of about 60% higher as compared to both wheat and cotton together and twice that of sugar cane and rice combined, but milk failed to fetch attention as a cash crop.

There are many causes of low productivity per animal which include low genetic potential of indigenous animals, late age of maturity, poor availability of nutrients, high disease incidence, unorganized marketing system, farming on conventional lines and increased inter-calving intervals. The most important cause is that the dairy sector has failed to attract the attention of policy makers, in spite of the fact that we have world renowned cattle and buffalo breeds. It chiefly functions on non-commercial basis as an unorganized sector and as small household farming of 2 to 3 cattle/buffalo, obtaining 30 to 40% of income from it, while the organized commercial sector processes a small share in milk production of the country.

The milk production per animal has not improved over a period of time. Present level of per animal productivity is not enough to meet the rising demand for dairy products. Our national livestock herd comprises of large number of low yielding animals that are exploiting feed and management of the more productive stock. This, in turn, decreases national average of milk production. In Pakistan, production per animal is low as compared to other countries. For example, three, six and seven dairy animals in Pakistan produce milk equal to one dairy animal in New Zealand, Germany and USA, respectively. However, to fulfill demand of more milk, improved animal efficiency will be an imperative.

The national livestock breeding policy and action plans were finalized in 2003 with the consensus of different stakeholders. It is unbelievable but true that there has never been any implementation of breeding policy in true spirit. Government allocated low and insufficient funds for development of livestock. Other dilemma is that the livestock products are not mentioned by Agriculture Prices Commission, though total values of livestock products have been higher as compared to all of the major crops. Livestock policies in Pakistan favor horizontal expansion rather than vertical. The policies are mostly formulated without farmers' participation and feedback. The experts while formulating the policies are mostly unaware of the actual scenario and nature of livestock production and potential in different agro-ecological zones. Moreover, the untrained/irrelevant staff of the livestock departments also aggravates the situation.

In Pakistan, progeny testing programs in Nili-Ravi buffaloes and Sahiwal cattle were launched to identify superior bulls. The accuracy of these evaluations is low and evaluations were delayed. To improve accuracy and to start programs in other breeds, proper technical and capacity building assistance is required. In Pakistan pure-bred cattle comprise 25-30% of total population and rest are non-descript low producers. Sahiwal, Cholistani and Red Sindhi are world famous indigenous dairy cattle breeds of Pakistan but their population is decreasing gradually mainly due to haphazard crossbreeding. The condition about the world's best milking buffaloes, *viz*., Nili-Ravi, is not convincing. The alarming condition is that life of elite female buffaloes used by the peri-urban milk producers mostly end up in slaughterhouses when dry; this is a major cause in drain of quality germplasm.

Selection of dairy bulls is important for breed improvement. Presence of undesirable bulls in the herd is the worst aspect of livestock breeding throughout the country. Production and distribution of high quality male/germplasm are promising aspects that require urgent and special attention for improvement in genetic resources of dairy animals. Breed improvement work in Pakistan has mainly revolved around artificial insemination (AI) programs. Although, Pakistan has well developed infrastructure for AI service in the country, the actual coverage of AI service to buffaloes and cattle is less than 10%.

There are about 2 million crossbred cattle in Pakistan. Cattle crossbreeding started in Pakistan in early 1970 and national breeding policy was formulated by which crossbreeding was limited to only non-descript

cattle but this policy failed to be implemented. Like many other countries, Pakistan has also imported exotic cattle in an effort to establish these breeds in the local environment. Several exotic breeds of cattle, notably "Holstein-Friesian, Jersey, Red Dane and Australian shorthorn" have been imported with various objectives including establishment of nucleus herds, use in crossbreeding programs or to develop commercial units of modern dairy-farming. Due to poor adaptability, these animals, under local environment and management conditions, usually lost their high productive capacity.

The prerequisite for genetic improvement of livestock is the development of uniform performance record. An economical model for record keeping of performance is necessary and should be applied in different geographical and socio-economic areas of the country. Detection of molecular markers for economic traits and their utilization in selection of animal can help in rapid genetic improvement of dairy animals in the country. For Sahiwal, Cholistani cattle and Nili-Ravi buffalo, progeny testing program should be improved and applied properly. In Sindh, for Kundi buffaloes and Red Sindhi cattle programs of breed improvement should be started. The policy makers should involve farmers so that such programs can become successful. Production potential and genetic relationship of different breeds should be examined and a conservation policy is also required. Indigenous dairy breeds need selective breeding programs that should be initiated by self-sustenance for long duration.

Last, but not least, primary purpose of implementation of livestock breeding policy should be to enhance livestock efficiency means increase in per unit production. By application of short-term, as well as, long-term improvement programs we can improve our livestock. Long-term improvement program policies should consider selective breeding of local breeds of buffaloes and cattle and in short term well organized crossbreeding program can be used for improved dairying. Besides this there is need to improve the infrastructure for livestock sector involving human capacity, data recording and evaluation, dissemination of proven germplasm through improved AI network.

Pakistan needs a competitive and profitable dairy farming industry not just for economic but also environmental and social reasons. There is need to formulate and implement a comprehensive livestock breeding policy keeping in view different agro-ecological zones and indigenous livestock breeds. Provincial led livestock developments due to devolution plan further demands adjustment of different stakeholders to higher expectations. All these developments necessitate revisiting of provincial livestock breeding policy.

INTEGRATED MANAGEMENT OF FRUIT FLIES IN ORCHARDS AND KITCHEN/BACKYARD GARDENING

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Fruit flies have been declared not only the quarantine pests but also a trade-barrier globally. Like other developing countries, Pakistan had been and is still facing severe food-safety, food-security, fruits-productivity and export issues due to fruit flies directly and/or because of pesticides residues above MRLs. In 2013, almost all mango consignments from Pakistan were disposed-off by the quarantine department of UK because of the detection of fruit flies maggots inside the fruits. A warning to Pakistan has been issued by 27 nation bloc of European Union**.** The U.K.'s Food and Environment Research Agency (FERA) reported that 6% of the total volume of Pakistani mangoes was denied entry last year due to presence of fruit fly maggots. The Department of Environment, Food and Rural Affairs (DEFRA) of United Kingdom has rejected and destroyed 50 tons of mango exported from Pakistan due to the presence of fruit fly resulting in a loss of 1.5 lakh pound sterling. World over, mango exporters suffered a loss of $3 million due to fruit fly. The monetary losses due to rejection of consignments of fruits and vegetables in international markets because of pesticides' residues above MRLs is still an anxious.

FRUIT FLIES OF ECONOMIC IMPORTANCE, THEIR LOSSES AND HOST PLANTS

FRUIT FLY SPECIES	HOST PLANTS	LOSSES (sever incidence)	PICTURE
BACTROCERA CUCURBITAE (Melon fruit fly)	• Cucurbits, Tomato	30 to 100% in cucurbits	
MYIOPARDALIS PARDALINA (BALUCHISTAN MELON FLY)	Cucurbits, Tomato	30-65%	
BACTROCERA DORSALIS (oriental fruit fly)	apricot, avocado, banana, citrus, coffee, fig, guava, loquat, mango, roseapple, papaya, peach, pear, persimmon, pineapple, cherry and tomato	Causes 5-100% losses to various fruits	
BACTROCERA CORRECTA (Guava fruit fly)	Citrus spp., mango peach, guava, castor bean, ber, jujube, Chinese date)	70-80%	
BACTROCERA DIVERSA	Anacardiaceae, Apocynaceae, Cucurbitaceae, Musaceae, Solanaceae	60-80%	
BACTROCERA ZONATA	Guava, Mango, Peach, Apricot, Fig, Citrus Most dominant species (94.7%)	80 percent loss in guava fruits	
CARPOMYIA SPP.	Ber and Jujuba	90-100% n ber 60-70% in jujuba	

Fruit flies' infestation in fruits and vegetables not only makes these commodities inconsumable but also results in

severe losses in crop yield. The female fruit flies also make the fruit unmarketable due to pseudopunctures produced on fruit skins during egg-probing behavior. The fruit flies' attack results in premature fruit-dropping or fruits spoilage.

LIFE CYCLE

The adult female fruit flies oviposit eggs inside the fruits just below the fruit pericarp. These eggs hatch out within 1-2 days. The emerging youngones (maggots) feed on the fruit-pulp inside the fruit transform into fully developed maggots within 6-9 days. The fully developed maggots pop out into soil and transform into pupae which complete their development within 8-10 days. The emerging adults last for 2-3 months but female start to deposit eggs after 2-3 weeks.

MODE OF DAMAGE OF FRUIT FLIES

Fruit flies damage the fruits, flowers and creeper's stems (depending on crop) with the help of their sharp needle like ovipositor present at the tip of their abdomen. They cause damages by following ways.

1. Adult female flies oviposit eggs in the ovaries of flowers. The emerging maggots start to feed inside the ovary. The infested flowers with damaged ovaries get dry and fall off on the ground resulting huge reduction in yield.
2. During probing for oviposition, the female fruit flies leave pseudopunctures on the skin of fruits deteriorating marketable quality of the produce.
3. During oviposition, the feale fruit flies also transmit into fruits the decomposing bacteria which results in the decomposition and spoilage of fruits with very obnoxious and pungent smell and fruits remains no more consumable and marketable.
4. The maggots (larvae) after hatching from eggs, start to feed on pulp of fruits and causes the decomposition and spoilage of the whole fruit due to their faeces and bacteria present in their faeces. The fruits infested with maggots fall off the tree.
5. During oviposition, the juice oozing out of fruits serves as a media for the growth of black fungus due to which red/black spots appear on the skin of infested fruits which reduce their marketable quality.

FRUIT FLY IS DIFFICULT PEST TO MANAGE

Fruit flies are considered very difficult pests to manage due to many of their biological and behavioral aspects. Fruit flies do not get food from leaves by sucking or by chewing like sucking or chewing types of insect pests, respectively because they have sponging type of mouthparts. They only visit the leaves for foraging or resting. So their control with systemic or contact poisons is unsatisfactory. The adult fruit flies just feed on nector, pollen, juice from fallen rotten fruit. But no spray is recommended/implemented at flowering stage of crop and/or on fallen fruit as there is no reason/logic for spraying on these stages. The adult fruit flies become active for egg laying till 10-11 am and again by 4-5 pm while they spend rest of the time underside of the leaf due to high temperature outside and come on leaf for outing purpose. These daily routine activities of adult fruit flies also help them to escape chemical exposure because no spray is schedules during these activity periods. Over-wintering in almost all life stages during off-season and overlapping generations during on-season also support their greater survival potential and better adaptation. The probability of fruit flies' management with insecticides is only 15% because spray mostly of contact poisons is made on upper side of the leaf and chances to come in direct contact to poison is very less while chances to come and sit on upper side of leaf about 15%. Chemical control of fruit flies with systemic poisons is not effective as fruit flies do not feed on leaf-sap. The eggs are deposited 2-3 mm deep in fruit pulp and avoid insecticides exposure; so 100% survival at this stage. The larval stage also feeds inside fruit on its pulp and again avoid insecticide exposure; so approximately 95% safety and survival. The pupae inside soil is the only stage which has minimum safety and can be targeted. Thus its life stages also make its management quite difficult.

YEAR-ROUND BIOLOGICAL ACTIVITIES OF ECONOMIC FRUIT FLIES

Efficient and effective management of fruit flies depend on understanding their year-round activities. Fruit flies overwinter in the form of adult, larvae and pupae during winter months (December- February). In the spring (Late February-March, the overwintering fruit fly stages come out of hibernation. The overwintering adult fruit flies come out of hibernation, search for food, mate and multiply on spring vegetables like cucurbits. During early summer (April-June), fruit fly population multiply on summer vegetables and then start to infest mango inflorescence and fruiting. During late summer (July-September), fruit flies infest guava and summer vegetables and multiply there. During these months, hot/humid conditions and rainfall subsequent with drop of temperature favor the fruit fly multiplication at rapid rate. During autumn months (October-November), fruit flies infest and multiply on citrus varieties. The late residual population of fruit flies on citrus varieties undergoes hibernation. The fruit flies complete 5-6 generations in a year.

MANAGEMENT OF FRUIT FLIES

PHEROMONE TRAPPING

Different types of sex pheromones including methyl eugenol, butanone acetate, cuelure, Terpentyl acetate etc. are used in monitoring and male annihilation technique (MAT). These sex pheromones are implemented through different types of traps including bottle-traps, delta-traps, barrel-traps etc. Cotton-wicks are soaked with pheromone and are placed in traps which are hung among the canopy of trees or in the field crops. Sex pheromones are also admixed with few drops of any toxicant like trichlorfon or spinosad to enhance their attract-and-kill potential. The male population of fruit flies are trapped and killed by using MAT technology in field crops and fruit orchards. This MAT technology should be

implemented throughout the year for sustainable management of fruit flies. MAT can be developed at the farm or it is available with name of "STATIC-PLUS-ME".

BAIT TRAPPING

Installation of bait-traps and/or application of bait-solutions in form of spray is very effective technique for management of male and female fruit flies. In this technique, attractive food sources composed of yeast, protein-hydrolysate, molasses, ammonia-source and attractive fruit-flavor are admixed with any toxicant (malathian, spinosad or trichlorfon) and are applied in orchards or field either in form of spray or inside the traps. In case of spray, the bait-solution is prepared and then is applied on whole canopy of boundary planted trees while inside the orchards, the bait solution is applied on 1 m^2 area of each alternate tree. Formulated fruit fly baits are available in the market or it can be prepared at the farm.

SANITATION

It is very effective technique to destroy fruit flies' breeding source and inhibit excessive outbreak and development of overlapping generations of fruit flies. The fallen fruits should be collected from the field and destroyed regularly either by burying fruit deep in soil or by treating/dipping fruits with insecticides solution to kill maggots inside fruits.

PLOUGHING AND CHEMIGATION

The field or orchards should be ploughed so that the maggots and/or pupae of fruit flies get exposed to heat and natural enemies like birds, ants etc. A reasonable proportion of fruit fly population cane be destroyed by ploughing the field followed by simple irrigation or insecticides' chemigation.

TREATMENT OF BED-SOIL BELOW TRELLIS/TREE-CANOPY

The bed soil below trellis or tree-canopy should be pulverized or hoed and admixed with any dust like lannet-powder, carbaryl-powder, sevin-dust or any other contact poison so that the maggots entering the soil for pupation and/or pupae are killed and adult emergence is prohibited.

BANDING TREE TRUNK WITH TOXICATED BAITS

Bands of 6 inch width is prepared by sewing three layers of jute-sacs. These bands are soaked with bait-solution or self-made molasses/Gur concentrates/slurry and are wrapped around the central stem of the tree canopy. These bands are refreshed by spraying bait-solution when needed during cropping season and off-season for sustainable management of fruit flies in hot spot areas.

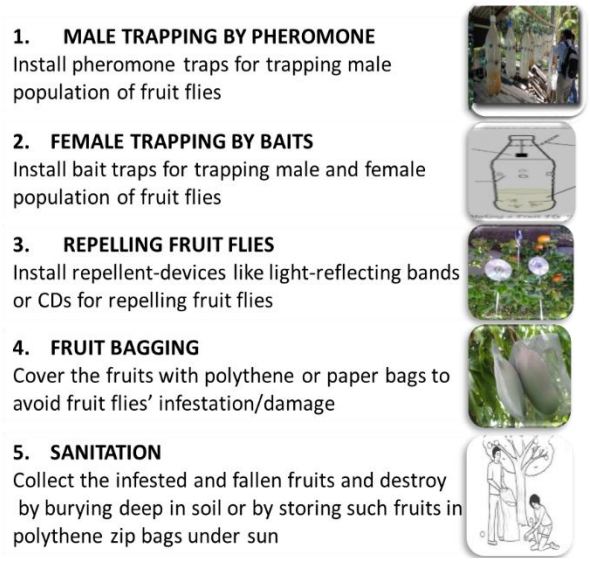
FOLIAR APPLICATION OF BAIT-SOLUTION ON INTERCROPPED NON-HOST PLANTS

Intercropping of field crops or orchards with 3-5 rows of some non-host plants like maize, sorghum and then spray-application of bait-solution or Gur-concentrates on these non-host plants proved very effective for fruit fly management as fruit flies rest and feed on such non-host plants after routine biological activities. The fruit flies resting on these plants feed on toxic food and are killed.

BIOLOGICAL CONTROL

In Pakistan, classical biological control of fruit flies is not very encouraging. However, naturally some biological control agents like larval or pupal parasitoids, predators and entomopathogenic microbes are controlling meager proportion of fruit flies population but their role in their management is not very significant.

FIVE STEPTS FOR ORGANIC MANAGEMENT OF FF IN KITCHEN AND BACKYARD GARDENING



CHEMICAL CONTROL

Insecticides as a last resort should be used as foliar application, under trellis/canopy treatment, in baits, in MAT. For foliar application, trichlorfon, spinosad, bifenthrine, malathian, methomyl, lamdacyhalothrin, deltamethrin, alphacypermethrin or any other recommended insecticides at their recommended dose rates are use against fruit flies. Any other insecticide with pungent odor can be used for repelling fruit flies from infestation.

AREA-WIDE AND YEAR-ROUND MANAGEMENT STRATEGY

Area-wide and year-round fruit fly management strategy is the only solution for sustainable management of fruit flies in orchards and field crops. The above mentioned tactics should be carried out throughout the years by all the growers (area-wide) as a community approach according to the give year-round fruit fly management wheel.