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Guest Editorial

Control Cum Exploitation of Locusts Attack to Enhance Productivity

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Abstract

Human population on the globe is expected to reach 9 billion by 2040 whereas food resources are shrinking. This has led an increased demand for exploiting the non-conventional food resources to be introduced in the food chain. Locusts have a significant impact on the history of mankind and are famous to severely damaging the crops resulted into historic famines. Experts should introduce modern and advanced methods to control the overwhelming harms before outbreak which are expected to occur. Moreover, use of locusts in the ration/feed of livestock, poultry, aquaculture, pets and zoo animals and/or in human food may help to exploiting the outbreak of this notorious species. Locusts are proposed for environmentally friendly and quality food production for animals and human being. Demand of commercial farming of locust is developing rapidly throughout the world. Therefore, locusts can be introduced into conventional foods of human and animal to fulfill the increasing demand of energy.

Keywords: *Locusts; Famines; Farming; Livestock; Poultry; Mankind*

Introduction

Human population is growing geometrically on the globe which is expected to reach 9 billion by 2040 [17], whereas agricultural land area which is prime and basic source of food production is abruptly shrinking due to unwise establishment of housing societies and unproductive uses. This has resulted into huge pressure on environment as well as on physical and biological resources [17]. Therefore, to fulfill the food demands of the huge population whilst relying on the limited resources in future has led an increased demand for non-conventional food resources [1,2,16-18,32,33,46-48]. Sustainable resource utilization, introducing feeds in feed chain that needs less land for potential production and altering the feeding habits i.e. taste development for new foods may solve the future problems [46,47]. More than 80 species of locusts (*Schistocerca gregaria; Locusta migratoria; Nomadacris septemfasciata; Locustana pardalina)*, grasshoppers (mostly Acrididae and Pyrgomorphidae including *Oxya velox, Oxya yezoensis, Ruspolia differens, Acrida lata , Sphenarium purpurascens and Oxya sinuosa*), crickets (Gryllidae including *Teleogryllus occipitalis*, *Acheta domestica*, *Gryllus bimaculatus*, *Teleogryllus mitratus*, *Tarbinskiellus portentosus* and *Brachytrupes portentosus*) are insects of the order Orthoptera commonly harvested for human food worldwide [11,15,39,46,47]. Locusts, grasshoppers and crickets are usually collected in the wild during cool hours of the day when these are less active and easy to catch or collect. Locusts are proposed for environmentally friendly protein production as these produce lesser amount of green house gases as compared to other animals [19,21,25,35,38]. Locusts produce 5 times more protein (environment friendly) per unit of fodder than cattle [21,25]. FCR (feed conversion rate) of orthopterans is 1.7 [49] whilst for beef it is roughly about 10 [44]. Locusts are enriched in protein (13 - 28 g/100g fresh weight basis) energy, vitamins and other essential nutrients such as essential fatty acid (linoleic, linolenic acids and oleic acid) and minerals i.e. sodium, phosphorus, potassium, calcium, magnesium, zinc and iron [3,10,16,17,39,40,49-51]. Performance varied between species. Demand of commercial farming of locust is developing rapidly in South East Asia and throughout the globe [13,16,17,33,46,47]. Locusts and grasshoppers can be included into conventional foods to produce products of good nutrient composition. In an experiment conducted at Egerton University migratory grasshoppers (*Acanthacris ruficornis*) and desert locusts (*Schistocerca gregaria*) were reared, dried and ground into powder to make composite flour with malted finger millet flour to have good protein digestibility [34] and for encouraging entomophagy [4,6].

Locusts and their devastating effect on the food chain

Locusts generally live alone but under some conditions they develop into big population, can travel great distances move around quickly in fields, consume green vegetation and damage the crops [5]. A single swarm (ranges one lac to a billion) locust can thoroughly eat 200 tonnes/day of food (cops/vegetation). They travel up to 150 km/day then stay in new area. These are notorious to cause famous historic famines and migrations of human [22,29].

Recent outbreak of locust in Pakistan

Recently an outbreak of millions of locusts has swarmed the Pakistan in early of 2020. The insects moved down upon Karachi and rapidly prevailed from Malir and Korangi and other parts of Karachi. However, this was a usual activity of migration process of locusts. Experts recommended the fumigation process to the affected areas to control over the problem. FAO had already warned probable attack of locusts in Pakistan.

Training of farmers: An easy control method for underdeveloped countries

Underdeveloped countries have not enough resources to control over locusts because of lack of funds to purchase sprayers/pesticides, lack of locusts control equipments, limited vehicles for transportation, lack of trained/experienced staff and lack of modern monitoring/communication system. However, in the areas where locusts' outbreaks are most common, farmers can be trained to exploit this natural feed ingredient for the high-quality protein production (Livestock, poultry and aquaculture) in order to get rid of the devastating activity of this creature.

Control strategies

Ancient people made strategies to avoid locusts attack by eating these insects. However, in 20th century, efforts were made to destroy the laid eggs of locusts by cultivating the soil, collecting insects with catching equipments, killing by incinerators, ditching, and crushing with rollers etc. [28]. In 1950s, a chemical method of application of organo-chloride dieldrin was found to be effective however its residual effect on the environment made its use banned thereafter [28].

Conventionally, insecticides were being used to spray from the ground or the air, these insecticides have to be repeated once a week to get rid of locusts and every 2 - 4 weeks thereafter for complete control [28] therefore, at the present time biological control is appreciated and provide effective control [31]. Household remedies are safe to the environment as compared to chemical appliances. Today the use repellents such Capsicum, garlic and onion extract has gained popularity due to quite effectiveness to prevent the locusts attack. The Extracts are applied to the soil and nearby spots, although these extracts do not kill the locusts rather cause them to run away from the field. Similarly, aqueous extract of grounded grains of paradise/Melegueta pepper can evoke a good control response.

Poultry, ducks and fishes love to eat locusts therefore, backyard poultry, duck along with parallel fish farming can convert devastating activity of locusts into a productive work. Fungus spores (*Metarhizium acridum*) can be sprayed in breeding areas of locusts so that these germinates the exoskeleton of locusts and attack the body cavity to kill the insect [7]. The fungus prevailed the whole population via insects [45]. This method is for the environment and for the other animals. Moreover, it adds the fertility of the land [16,42,43]. GPS, GIS tools, and satellite imagery are advanced technologies and computers offer rapid data management and analysis to control over locusts attacks [8,30].

Commercial locust farming

Locusts have nature of outgoing and migratory when their population hugely increased. These are pest of historical importance which are notorious to severely destroy/damage the crops. In an experimental trial conducted in India, *Oxya fuscovittata*, *Oxya hyla* and *Spathosternum prasiniferum* were reared in experimental jars [13]. Results revealed that *Oxya hyla* species showed higher value of production, fertility and body weight and lower values for mortality when compared to *Spathosternum prasiniferum*. *Brachiaria mutica* [14] and *Oxya fuscovittata* are also found potential for efficient production [20].

Use of locusts and/or locusts' meal in livestock, aquaculture and poultry production

Locusts are talked about in the Jewish (Book of Exodus), the Christianity and the Islam [23,24,28,42,43]. Using locusts in the ration/feed of livestock, poultry, aquaculture, pets and zoo animals and/or in human food [46,47] may help to lessen the need of chemical/pesticides, thereby, helps in maintaining healthy environment [9,27,36,37].

Having available in large quantities after locust outbreaks, highly nutritious dead locusts, grasshopper, cricket, katydid and other insect species are being used pets and zoo animal diets and also been reported to be successfully used in ration of livestock and poultry [34]. Poultry species especially ducks may successfully help to control locust populations. Also, locusts can also be used to produce alternative protein (fish farming). Moreover, these can be boiled, dried and ground to make locust meal to be used in livestock and poultry feed on large commercial scale.

Conclusion

Locusts attack has been reported to cause chaos through the whole-time history of human. These are voracious eaters and a single swarm can disrupt the twenty percent of the Earth land depriving the huge human population from food resulting in to disaster and threat to food security. Currently, use of chemicals and insecticide is more prevalent which have potential environmental consternations. On the other hand, microbial bio-pesticides have been considered a hopefully patent solution to control locusts swarm at large scale. However, the significance of biological control by adopting use of locusts for animal production may be more fruitful and productive. Therefore, to address the problem, a well designed modern locusts control program involving the introduction of crops of less concerns/interest of locusts in areas where attacks are more common is essential, moreover, introducing livestock/poultry species which can potentially use locusts will improve the productivity of ecosystem.

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