Short Communications

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A PROBABLE SOURCE OF CYTOCHROME OF BACTERIAL ORIGIN

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A muscle which could be qualified as indefatigable is that of mammalian heart. We know that blood on reaching the lungs returns with its haemoglobin loosely bound to oxygen as oxy-haemoglobin. This on reaching a tissue cell hands it over to its cytochrome which thus serves as the immediate donor of oxygen. In as much as the energy of the muscle depends upon oxygen supply and this upon its donor cytochrome, the pigment is necessarily rich in the heart muscle which is the most indefatigable that we know. The biochemist when he wishes to prepare cytochrome finds no better source of it than the mammalian heart.

When we turn to comparative physiology and inquire what comes next to the mammalian heart, as the indefatigable muscle, it would probably be the muscle of Sing-cicada. One such insect is *Platypleura octoguttata*, Fab. Its one favourite host is *Pithecolobium saman*, the rain tree. It is found as an avenue tree in Bangalore, South India, and also in other localities, otherwise mostly on leguminous species. The noise is produced by rubbing the front wings against the sides of the body, but the noise can continue from dawn to dusk so that the muscles responsible for the movement of the wings never appear to get fatigued. Dissection would reveal that the front wings are attached to short and compact muscles, like columns, at once impressive by their mass. Now the colour of most insect muscles is white but that of the above cicada is pink or brick red. The insect carries a bacterium in symbiosis. The germ was isolated and proved to be short rods. But most interesting was to see that the bacterial pigment is identical with that of the insect muscle. The same red pigment, by further transformation was responsible for bright red patches at the base of front wings. I had previously found other cases of symbiotes directly producing pigments of their insect hosts one such being *Cicadella viridis*, on which an article has been published accompanied with colour illustrations.[1] In this light no doubt was left that the symbiote of *P. octoguttata* also produces the pigment of its muscle and this must be cytochrome to account for the muscles being so active.

Cytochrome was named by Keilin, but it was originally discovered in the muscle of the blow fly. This insect shows hovering flight which entail much work on the muscles of the wings. As such the muscle of the blow fly had to be rich in cytochrome. But when we dissect the blow fly and compare its muscles with that of the cicada, the latter is pink, while the former is white, showing that the pink colour is due to an enrichment of cytochrome and this was required far more by the cicada than by the blow fly.

The interesting point that suggests itself is the possible production of cytochrome on a commercial scale. The active principle of liver extract turned out to be cyanocobalamin or vitamin B_{12}. This is now produced as a byproduct of a fermentation industry. Cytochrome at present is very expensive. A bacterium seems to produce this pigment in a sufficiently concentrated form and as such may be exploited to produce it industrially. Cytochrome is found in most bacteria but here is probably one which may be looked upon as the richest in it.

Reference

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SOME PRELIMINARY REMARKS ON ZYGINIDIA QUYUMI (AHMED), AN IMPORTANT PEST OF WHEAT AND MAIZE IN SOME PARTS OF PAKISTAN

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Ahmed[1] described the species *Zyginidia quyumi* (Typhlocybinae: Homoptera) reportedly collected on maize (*Zea mays*) from Quetta, and Abbottabad. The species was not regarded at that time, of special economic significance. Later on the present workers undertook a preliminary sampling of the insect species affecting wheat and maize during the crop seasons of 1970–71, and discovered that it is a pest of high economic significance in some parts of the Punjab and N.W.F.P. on both the crops.

Repeated sampling in the typical wheat and maize growing areas of Sind did not yield even a single specimen of *Z. quyumi* (Fig. 1). The southern districts of the Punjab, including Rahim Yar Khan, Bahawalnagar and Bahawalpur also hold negligible numbers of *Z. quyumi* on wheat and maize.

The districts of Multan, Sahiwal, Lyallpur and Jhang forming the wheat growing belt of the central Punjab are the most affected by the leafhopper species. After the winter the population of the leafhopper gradually increases in these districts and soon becomes the heaviest of the entire wheat growing areas of West Pakistan. The wheat crop is severely damaged due to the feeding activity of these leafhoppers. In the adjoining districts of Muzaffargarh and D.G. Khan in the south-west, and Lahore, Sheikhupura and Gujranwala in the north-east, the leafhopper infestation is mild, but occasionally becomes as heavy as in the above referred districts of the central Punjab.

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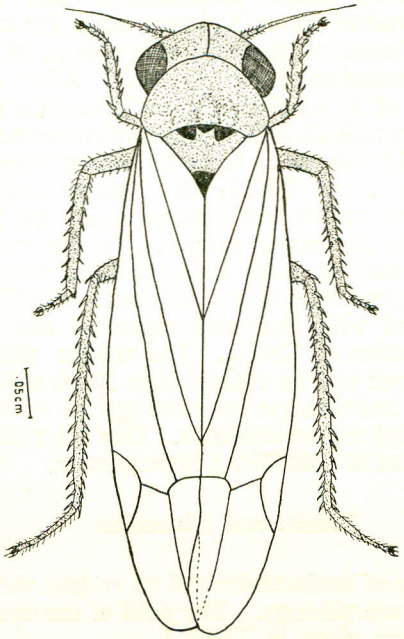

Fig. 1. *Zyginidia quyumi.*

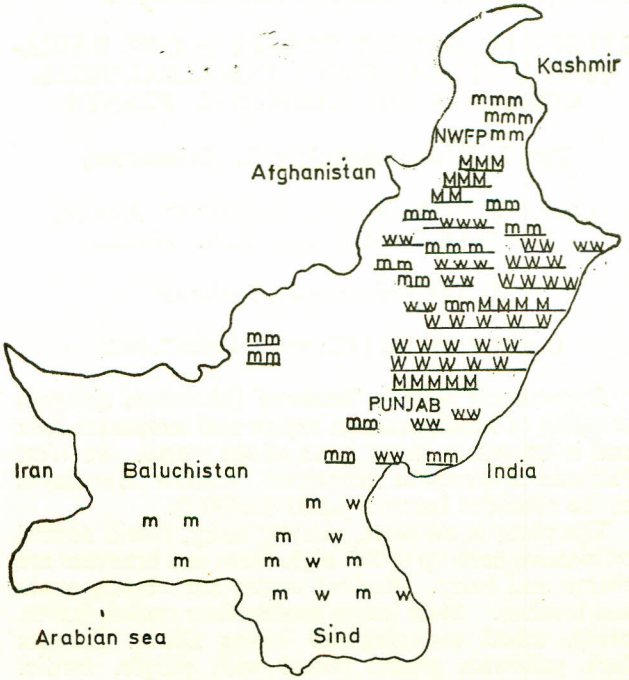

Fig. 2. Map showing occurence of *Zyginidia quyumi* on wheat and Maize. MMM Areas with heavy attack on maize; mmm Areas with minor attack on maize; mmm Areas with no attack on maize; WWW Areas with heavy attack on wheat; www Areas with minor attack on wheat; www Areas with no attack on wheat.

Still farther north the population of *Z. quyumi* on wheat dwindles down to negligible numbers in Sargodha, Mianwali, Gujrat, Jhelum, Rawalpindi and Campbellpur districts. The wheat in these areas is comparatively safe from the attack of *Z. quyumi*. In most of the parts of N.W.F.P. the wheat crop is harvested late as compared to the Punjab and Sindh. It is at the last stages that wheat gets infested by the leafhopper and suffers insignificant damage. It appears that the rapid multiplication of the pest on wheat in N.W.F.P. is checked in March–April mainly by the low temperatures. The temperature in the central Punjab by March is fairly good, and favourable for the rapid breeding of *Z. quyumi.*

The leafhopper population on wheat increases in the middle of March, depending on the local weather conditions and continues till slightly before harvest in the last week of April. Before wheat is harvested, the maize crop is already sown and there is witnessed a mass migration of adults from drying wheat plants to young green maize plants. Most of the nymphs, which have now appeared in huge numbers on wheat, perish in the process. The tendency to leave the old host plants does not appear to be inborn, but rather an environmental obligation. The maize, at first is very sporadic, and in the central Punjab is usually grown as a fodder crop. The early grown crop is cut and used in about 2 months time. The host plant is not continuously available to the leafhopper for an uninterrupted feeding and breeding, during the long summer. Uptill November the leafhopper survives on maize, and as soon as the early sown wheat germinates, it becomes the main source of food for the leafhopper to survive through winter. The population rapidly falls as the winter approaches.

In the typical maize growing areas of N.W.F.P. the last generation of adults are forced to migrate to semi-wild alternate host plants, on which they survive as adults in very small numbers. The revival of the leafhopper population is very late, due to extremely low temperatures in winter. The first appearance of leafhoppers is on alternate host plants, from where they start shifting to wheat, when the crop is nearing harvest. Soon after the maize crop appears and the leafhoppers migrate to it.

The districts of Hazara, Campbellpur, Mardan and Peshawar are extensively maize growing areas. If the rains are properly timed, the maize is sown there from middle of May to middle of June. The leafhoppers which now build extremely heavy population on semi-wild alternate host plants, show a mass shifting to newly appearing maize. Soon after, the population of the leafhopper *Z. quyumi* rapidly increases on maize, and if not interrupted by rains, becomes extremely heavy. However the hilly areas of Hazara district, Azad Kashmir and Swat valley receive heavy rainfall from the month of July to September, which destroys a major part of the population of *Z. quyumi.* In those areas where rainfall is not so frequent and heavy, particularly the districts of Mardan and adjoining parts of Campbellpur and Peshawar, the population of *Z. quyumi* becomes very high in some pockets.

It is conceived by the present workers that *Zyginidia quyumi* is a serious pest of wheat in the central Punjab and maize in the northern Punjab and some parts of N.W.F.P. (see map). Further studies on the bioecology and control of the leafhopper are in progress.

Reference

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