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COMPARATIVE CONSUMPTION OF SORGHUM FOLIAGE BY THE ADULTS OF THREE GRASSHOPPER SPECIES.

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The amount of sorghum (*Sorghum vulgare*) leaves consumed by the adults of *Acrotylus humbertianus* Sauss., *Aiolopus tamulus* Fb. and *Chrotogonus trachypterus trachypterus* (Blanchard), under natural and semi-natural conditions, was studied. The consumption was maximum in the adults of *Acrotylus* and *Chrotogonus* species. The females of all the species consumed more as compared to males and the consumption, under natural conditions, was generally greater than that under semi-natural conditions. The significance of these variations was discussed on a metabolic basis and practical implications of these studies suggested.

INTRODUCTION

Grasshoppers are generally reckoned as serious pests of agricultural crops and vegetables. Their indiscriminate and voracious feeding habit has attracted the attention of many workers all over the world. Of the various members of this group described so far in Pakistan, *Acrotylus humbertianus* Saussure, *Aiolopus tamulus* Fb., and *Chrotogonus trachypterus trachypterus* (Blanchard) rank among the most abundant species.

Most of the investigations conducted on these grasshoppers, in Pakistan, relate to the study on their life history, description of hopper-stages and development of genitalia etc. (Haq, 1950; Ahmad, 1958 and Ayaz, 1959). But the real damage done by these species to various crops, which forms an essential prerequisite for finding the pest status and ultimately for suggesting the suitable control measures for them, has been hardly attempted, at least on comparative basis. The only available reference in this context is that of Ali (1968) and Akhtar (1971) who carried out some laboratory tests on the consumption and utilization of some plants by *Chrotogonus* adults.

The aim of the present investigation, therefore, was to find out the amount of food consumed by these grasshoppers, under semi-natural and natural environments. Sorghum, being one of the most relished food of these species has been tested experimentally.

MATERIALS AND METHODS

The adults of *Acrotylus, Aiolopus and Chrotogonus* species were bred in the laboratory at ambient temperature and humidity. Top leaves of sorghum

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at an early whorl (4–leaf) stage were served as food. For this purpose five, one day old, male and five, female adults, of each of the three species, were used for the experiment.

For field studies, the insects were enclosed singly, in a wire gauze cage (10"x4") with the leaves of sorghum plants, *in situ* The observation on the amount of food consumed by the adults were recorded, 24 hours after confinement. The leaf area eaten was measured by marking out the sorghum leaves on a graph paper, before and after feeding, for three consecutive days. The weight of food consumed was determined by punching out, from another representative sorghum leaf, an area equivalent to that eaten by the individuals concerned and weighing it.

For observations under semi-natural conditions, practically the same procedure was adopted as in the field, except that the leaves served to insects were fixed in the moist soil to keep them fresh as long as possible. In these trials, the weight of leaf eaten was recorded by weighing the leaf before and after the feeding. Every day, a fresh leaf was introduced and the old one discarded.

RESULTS AND DISCUSSION

A perusal of the data in Table 1 (F) shows that the amount of sorghum leaves consumed by the grasshoppers, used in these tests, varied with the species, the sex and also with the environment.

TABLE 1. *Amount of food consumed by the adult grasshoppers*

Species	Sex	Average body wt. of the individuals, in gms. (B)		Average wt. of food consumed per day, in gms. (F)		Ratio of food consumed to body wt. per individual. (F/B)	
		Semi-natural	Natural	Semi-natural	Natural	Semi-natural	Natural
Acrotylus	Male	0.85	0.92	0.29	0.35	0.34	0.38
	Female	1.88	1.74	0.46	0.48	0.24	0.27
Aiolopus	Male	0.76	0.78	0.24	0.29	0.31	0.37
	Female	1.45	1.53	0.34	0.39	0.23	0.25
Chrotogonus	Male	0.65	0.67	0.31	0.35	0.47	0.52
	Female	1.48	1.44	0.43	0.45	0.29	0.31

The *Chrotogonus* and *Acrotylus* adults consumed more food, under both environments, compared with those of *Aiolopus* species. The females of all the species, under both environments, consumed more leaves than their respective males. Similarly, the consumption of all the species under natural environment was higher, than under semi-natural environment. The variations in the food consumption can be attributed to the specific factor studied and/or to individual differences in the body weight of grasshoppers.

Considering body weight alone (Table 1, B) the heavier ones of each species consumed more food than those which were lighter. Although, the corresponding figures for each sex within a species are not available, this suggests that there exists a direct relationship between the body weight of insects, within each species, and their food consumption. But, in view of the facts that the metabolism of an animal (other that insects) is $\propto$ (to its surface area = body weight $^{0.75}$ (Kleiber, 1961), it would be safe to assume that the metabolism in insects too, have the same relationship with their body weight. If this presumption is true, then it could by said that heavier insects consumed more food because of the higher metabolism. But, in insects, food consumption is also proportional to its utilization (Dadd, 1960 and Ali, 1968). This would, therefore, mean that food consumption in grasshoppers is proportional to its utilization and/or metabolism. Thus, a higher food consumption, in the cases referred to above, would indicate its higher utilization because of higher metabolism and *vice versa*.

But, the relationship between body weight and food consumption, discussed above, does not hold true when considered on a bit wider scale, between species to species and between one environment to another. Hence, the body weight, though very important as discussed, is not the sole cause of variations in food consumption, and thus some other factor/(s) of individual character linked with the factors studied is/are also involved.

Before, the actual role of any such factor/(s) is discussed, it is desirable to eliminate the influence of differences in body weight by expressing the data on the basis of food consumption per unit body weight of each individual (Table 1, F/B). The data expressed, on this basis, also, indicated a variation in values, from species to species, sex to sex and from one environment to another. The F/B values were higher in the case of *Chrotogonus* adults, in the females of all species and under natural conditions, compared with the respective corresponding cases. On the whole, it appeared that heavier insects consumed less food per unit body weight compared with those that were lighter.

This was probably because larger insects have lower metabolic rates than smaller ones (Chapman, 1971). Thus, it is logical to presume, at this stage, that consumption per unit body weight is an index of metabolic rates (Kleiber *loc. cit.*). If so, a higher F/B value represents a higher metabolic rate of the concerned individual and *vice versa*.

Now, since the total food consumption in each individual, is the result of its consumption per unit body weight and its total weight, it could be concluded that the present variations were due to the combined influence of the metabolism and its rate on the food utilization of each individual. Thus, a higher food consumption in the case of *Chrotogonus* and *Acrotylus* adults, the females of all species and also under natural environment was due to the higher metabolic activity of the insects, in these cases. A reverse situation in the other cases point out to the contrary.

Research efforts to explore the real truth underlying these comments, if made, may lead to very interesting conclusions of great fundamental significance. Further more, on the basis of food consumption *Chrotogonus* and *Acrotylus* adults could be regarded as being more serious pests of sorghum compared with *Aiolopus* adults and suitable control measures for them could be recommended to be worked out.

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