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The genetic polymorphism of the longitudinal veins of tegmina in the grasshopper Aiolopus thalassinus (F.) (Orthoptera: Acrididae)

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Summary

Samples of adult **Aiolopus thalassinus** (F.) were collected from the meadow of Dumlupınar, Ankara in 1975. On tegmina of the male and female individuals three distinct branching forms of radial sector vein and difference in number of radial sector areas were determined. There is not any intrinsic relation between the number of branches at the radial sector with number of hopper instars. It has been understood that F_1 generations maintained their heterozygot composition due to different allelic genes.

Introduction

Extrinsic or intrinsic variations due to the environmental factors, plasmic differentiation in sexual cells or gene recombinations could be seen between individuals of a population of a species.

In certain species, however, the members of a population can be separated into very definite groups, determined by the presence of certain conspicuous characters. Such discontinuous individual variation is called polymorphism. Frequently such polymorphism is controlled by a single gene transmitted by simple Mendelian inheritance (Mayr et al. 1953).

Discontinuous individual variation or polymorphism is more pronounced in some families of insects than in others. The spotting in lady beetles (Coccinellidae) is a well-known example of genetic polymorphism, as is industrial melanism in moths (Mayr et al. 1.c.).

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According to Essig (1952) in the aphid genus **Periphyllus,** there are as many as 17 distinct recognizable forms, some of which are so different form the others that they have been mistaken for separate species. Among social insects, especially in termites and ants, polymorphism reaches its highest level. As many as 12 distinct series of castes and forms occur in the species of **Eutermes.**

Halkka et al. (1973) recorded the genetic basis of balanced polymorphism in **Philaenus spumarius** (L.) (Homoptera: Cercopidae).

Striking polymorphism is particularly frequent in the Orthoptera. Faure (1932) studied the phase polymorphism in locust of South Africa. Ragge (1955) has described and illustrated the general branching form of the typical veins in wings of the Orthoptera. According to the author, the number of branches of the radial sector often varies in different individuals of the same species. Jago (1963) explained the morphological polymorphism in some **Calliptamus** species. Uvarov (1966) noted the occurrence, causation and function of the phase polymorphism on the nymphs and adults o fmany different grasshoppers and locusts. Also, the author mentioned from his publication dated 1921, in which confirmed a substantial difference in tegminal venation in **Locustana.** The tegmen of the gregarious locust is relatively broader and the medial area which includes the stridulatory vein is expanded. Further, the difference in the number of antennal segments reflecting the number of hopper instars. Byrne (1967) recorded nine colour patterns in the Australian Acrididae, **Chortoicetes terminifera** Walk. which appear to be determined by a single locus with four alleles.

Material and Methods

The adults of **A.thalassinus** were collected throughout from the reservation area of Dumlupınar, Ankara in 1975. These specimens were kept in the cage, having the dimentions 45x25x25 cm and at suitable temperature of 30∓5°C and 50-75 % relative humidity. The locust were fed with **Cynodon dactylon** L., **Medicago sativa** L., **Lolium perenne** L., **Agropyrum repens** L., **Poa annua** L. and wheat bran. The eggs laid into the tubes by the females. After the hatching of the eggs, each one of 64 nymphs put in a small cultur jar and they reared in the incubator at constant temperature of 30°C and 65-75 % relative humidity. By this method, number of hopper instars and branching number of radial sector vein on tegmina were determined at the male and female individuals. The male and female adults which their characters were determined under the laboratory conditions,

copulated at four combination as seen in Table II. At each one of 105 nymphs, number of instars recorded in F_1 generation and branching forms of radial sector on tegmina of adults were observed again.

Results and Discussion

Nearly four years ago, in the village Dumlupınar, Ankara, the present author collected three distinct forms which have different venation of the radial sector vein on the tegmina of **A.thalassinus.**

The number of branches of the radial sector (R_s or R_2) on the radius (R) has been seen to be rarely one (Fig. 1 a), generally two (Fig. 1 b) and sometimes three (Fig. 1 c) in different individuals.

If the radial sector has one branche, in that case two radial sector areas occur (Fig. 1 a), if it has two branches, have three areas (Fig. 1 b), in having three branches, forms four areas (Fig. 1 c).

Under the same ecological conditions, the effects of the environmental factors to the differences between individuals of a population are more weaker. In that case, it has been possible to find effects of the other factors.

By this study, between ramification of radius with the number of hopper instars whether correlated or not has been investigated. The percentage of possible correlation between the number of R_s branches with the number of hopper instars is given in Table I.

Table — I

The percentage of the correlation between the number of R_s branches with the number of hopper instars in **A. thalassinus**

Number of hopper instars	Number of branches of the radial sector		
	1	2	3
6	—	37.4	62.6
5	7.3	83.5	9.2

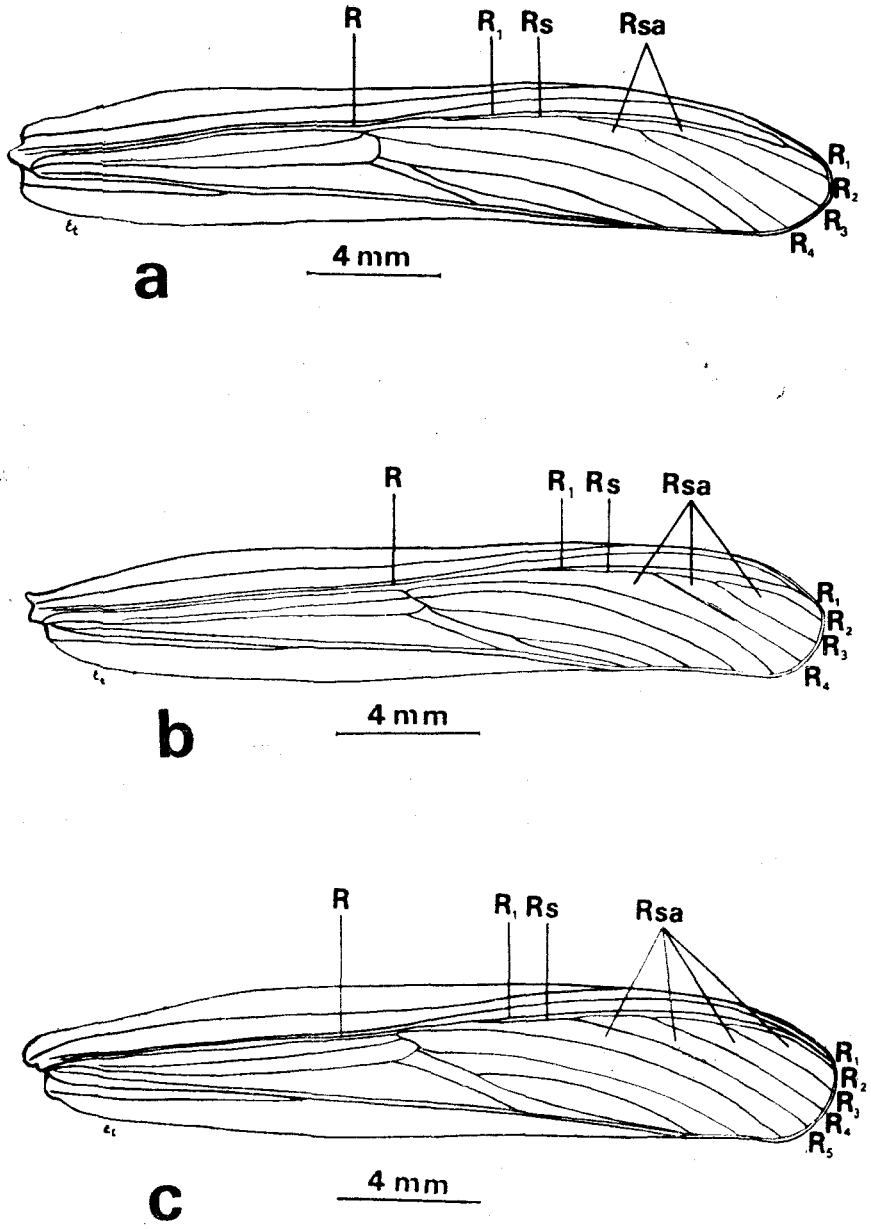

Fig. 1. The forms of branches of the radius on tegmina in different individuals of **A. thalassinus** (a, b, c): R, radius; R_1, anterior vein of the radius; R_S, radial sector or posterior vein of the radius (R_2); Rsa, radial sector areas (Cells); R_{2-5}, radial sector veins.

In Table I, as it is observed, if male and female individuals of **A. thalassinus** have become adult after the 6 th instar, two and three branches from the radial sector (Fig. 1 b, c), have been recorded in ratios 37.4 % and 62.6 % respectively. If male and female individuals have become adult after the 5 th instar, one, two and three branches from the radial sector (Fig. 1 a,b,c) have been seen in the ratios 7.3 %, 83.5 % and 9.2 % respectively.

Intrinsic relation between the number of branches at the R_s with number of hopper instars tested in the laboratory. For this purpose, four pairs of adults which their characters were known separately reared under the laboratory conditions. After a few days, copulation began and the eggs laid. The results of the experiment are given in Table II. Number of hopper instars recorded in F_1 generation and branching forms of R_s on tegmina were observed when they become adult. Also the number of adult were recorded according to the sex.

Table— II

The composition of F_1 generation, in four series, after copulation of the parental adults, having 5 or 6 instars, with two or three R_s branches

Series	Parental generations ♀ x ♂	The number of nymphs in the experiment	F_1 generation	The number of adults (F_1) ♀	x	♂
I	A_3 x A_3	26	B_2	5		—
			A_2	—		4
			A_3	—		6
II	A_2 x B_2	35	B_2	4		6
			A_2	—		3
			A_3	—		5
III	A_3 x B_2	12	B_2	4		—
			A_2	—		3
IV	B_2 x B_2	32	B_2	7		6
			A_2	—		4
			A_3	—		3

A_3-An adult having six instar, with 3 R_s branches,
A_2-An adult having six instars, with 2 R_s branches,
B_2-An adult having five instars, with 2 R_s branches.

In Table II, it is shown that, F_1 generation has inequality alleles which have received from the parents. Therefore F_1 generation has heterozygot combination in each four series of copulation. Besides, it has been understood that there is not a certain relation between the number of R_S branches with the number of hopper instars and sexuality.

It has been come to a conclusion that a great number of parental and F_1 generation are required in order to understand the real cause of various branching forms of R_S vein on tegmina of **A. thalassinus** and make genetic analysis of this complex.

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Özet

Aiolopus thalassinus(F.) (Orthoptera: Acrididae)'da tegminanın boyuna damarlarında görülen morfolojik farklılıklar

Ankara'nın Çubuk ilçesine bağlı Dumlupınar köyü rezervasyon alanından toplanan **A. thalassinus** erginlerinde, tegminanın boyuna damarlarından Radius'un farklı dallanma gösterdiği ve dolayısıyla da radial-sector alan (hücre) sayısının değiştiği saptanmıştır. Radius'un dallanma şekli ile nimf dönemleri sayısı arasında kalıtsal bir bağıntının bulunmadığı anlaşılmıştır. Çaprazlamalar sonunda, F_1 döllerinin farklı allel genler nedeniyle heterozigot durumunu koruduğu belirlenmiştir.

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