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ON THE ESTABLISHMENT AND DISTRIBUTION OF CASCA SMITHI COMP.
A PARASITE OF CHRYSOMPHALUS AONEDUM L. IN ISRAEL

by

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During 1956, two parasites were brought from Hong-Kong into Israel in order to control the pest, Egyptian black scale Chrysomphalus aonidum L. This diaspid had spread from the northern citrus growing area of the country to the south, and was causing severe injury and damage to the trees, seriously reducing the amount of export quality fruit available. The situation further deteriorated when the application of synthetic insecticides as cover sprays against Mediterranean fruit fly came into practice. The pest population increased to such an extent that in many groves even such severe measures as oil application brought little amelioration of the situation (Rivnay, 1968). At the suggestion of Dr. Flanders of UCR, Riverside, Calif., Mr. Cheng of Hong-Kong was contacted by the Citrus Marketing Board regarding supply of parasite. He collected the parasites and about seventy air shipments were made during 1956 to Dr. Rivnay of the Volcani Institute of Agricultural Res. (Rivnay, 1968).

After some laboratory test breedings were carried out, the parasites were dispersed by Rivnay in two citrus groves in Rehovoth. The 1956 shipments contained mainly Aphytis spp. specimen from one shipment were described later however, by De Bach, as Aphytis holoxanthus. In 1957, mainly Casca smithi Comp. was received. Thus, Aphytis were released in the groves during 1956. About one and a half years later, the parasite had spread in all directions from the focal point of release over an area of about 15 kms. Casca smithi were released during Dec. 1956 and in the spring of 1957; recovery, which was not made until five years later, was slight. The failure to recover this species sooner stimulated the belief that the first few offspring of this species were exterminated by the already well established Aphytis, which is known to mutilate the host along with its parasites, A warning concerning this was made by Flanders in his letter of 1955 (Rivnay, 1968).

When Casca smithi was recovered in 1962 by Rosen (Rosen 1964), Aphytis holoxanthus was predominant in the area and Casca very rare; in fact, the first individuals of Casca were collected from Egyptian black scales found on palm trees situated less than one kilometer from the point of release.

Gradually, along the coastal area citrus groves, this parasitization eliminated the scale pest and only slight outbreaks occurred sporadically in various parts of the country. Surveys revealed that C. smithi had become more numerous and had spread to areas beyond Rehovoth, It was decided, therefore, to study this progression more closely in order to clarify its parasitization in relationship to that of Aphytis.

METHODS

Surveys were made in citrus groves in all parts of Israel. Any leaves or fruit having Egyptian black scale were examined in the laboratory. Counts were made and the species of the parasite, stage of development and percentage of parasitization by each species were noted. Dead scales with exit holes of the respective parasite were included in the percentage of parasitization.

RESULTS

The first discovery of C. smithi in groves outside the Rehovoth area was at Gan Sorek in March, 1966 (10 km. northwest of Rehovoth). In December of the same year, a focus of Chrysomphalus aonidum L. was discovered in a grove at Mikveh Israel; 70% of females were parasitized, mostly with Casca and only a few with Aphytis. This situation persisted throughout 1967. Also in December 1966, a scale focus was discovered at Gan Efrayim. Here, also, the parasitization consisted mainly of Casca, with very few Aphytis. In January 1967, Egyptian black scales collected at Ein Vered were affected equally by both parasites. This indicated a further spread northward - to about 40 km. north of Rehovoth. At Kfar Monash, in March of the same year, Casca smithi only were found to have attacked Chrysomphalus aonidum, while at the end of the year, signs of Casca smithi parasitization were discovered at Beit Dagan at Beit Yitzhak, and Hama'apil, 15, 50 and 60 km respectively from Rehovoth.

The data obtained from inspections during the season 1968-69 are tabulated in Table 1. It is evident that Casca had spread during this season farther north, reaching the groves of Habonim along the coast. Apparently Casca has not yet reached the Esdrealon Valley, nor Gesher (in the Jordan Valley) and there is no appearance in the Upper Galilee, neither at Kfar Gil'adi nor at Ami'ad. In the sites within its distribution area, Casca retained its predominance at Gan Efraim, Habonim, Beit Dagan and Na'an. At Beit Gamliel every scale insect found was parasitized with Casca.

Summarizing, it would appear that as long as the host population was dense and crowded, Aphytis holoxantus was predominant and Casca smithi scarcely noticeable. As the host population became reduced, Casca became more conspicuous, and was present in larger numbers than the previously predominant Aphytis.

In order to understand this situation, it is worthwhile to enumerate the characteristics of both parasites. Aphytis holoxantus completes its development at 27°C within 12-14 days; it lays one or two eggs externally in one host; it has the habit of mutilating its host. As regards feeding habits, it bores a hole into the host female and with its ovipositor mutilates it: the liquid which oozes from this puncture serves as food. However, in mutilating its host, it may kill also any parasite, even of its own kind, that may have established itself in the host individual. Casca smithi, on the other hand, develops more slowly; at room temperature development is complete within about 3 weeks. It may lay several

eggs internally in one host - a dozen were found in one scale. Its life span is about twice that of Aphytis, but most of the eggs are laid within the first few days. (The opinion has been expressed that in the laboratory the females did not obtain the food needed for development of the full complement of eggs. In the field, Casca females, like those of other parasitic hymenoptera, may feed on succulent plant tissues (Flanders, 1969).) Aphytis females continue to lay throughout their lives. Another feature of C. smithi which has been observed on breeding is a preference to lay eggs in hosts that are not crowded. Finally, this insect seems to have a better capacity for finding its host.

These last two features as well as the mutilating habit of Aphytis provide a basis for understanding the situation as described. The crowding of the host in 1957-59 did not encourage oviposition by Casca. What little population that may have developed was stunted or quelled by the already well established Aphytis. When the host became rare, the Casca could locate it quicker than the Aphytis, although the latter had been established all over the country. Casca spread gradually and established itself in the coastal plain. Lately, Casca has been distributed by the Citrus Marketing Board in the Jordan Valley; it will be of interest to follow its development under the climatic conditions there.

REFERENCES

- Flanders, S. E. (1969) letter of June 13th.
- Rivnay, E. (1968) Biological Control of Pests in Israel.
Israel J. Entomology 3 (1), p. 156.
- Rosen, D. (1964) Parasites of the Coccoidea, Aphidoidea and Aleurodidea on Citrus in Israel. Ph. D. Thesis, Hebrew University, Jerusalem. p. 220 (in Hebrew, with English summary).

Table 1.

Locality	Date	No. of scales examined	No. of parasitized scales		No. of liv- ing scales
			by <u>Casca</u>	by <u>Aphytis</u>	
Mishmar Ha'emeq (EV)	6. 11. 68	107	-	10	68
Gan Shemuel (CP)	10. 11. 68	18	-	4	10
Gan Efrayim (CP)	15. 11. 68	197	34	20	84
Gesher (JV)	18. 11. 68	275	-	-	166
Megiddo (YV)	9. 12. 68	166	-	2	139
Habonim (CP)	10. 12. 68	89	61	3	13
Rishpon (CP)	20. 12. 68	17	7	9	-
Gan Efrayim (CP)	30. 12. 68	99	17	8	45
Beit Dagan (CP)	31. 12. 68	54	15	2	17
Ramat Yohanan (CP)	5. 1. 69	158	-	-	30
Na'an (CP)	14. 1. 69	24	7	2	6
Giv'at Brenner (CP)	6. 2. 69	77	39	10	3
Beit Dagan (CP)	19. 2. 69	50	23	1	8
Habonim (CP)	23. 2. 69	126	20	15	62
Kefar Gil'adi (UG)	25. 2. 69	184	-	1	97
'Ami'ad (UG)	25. 2. 69	311	-	27	13
'Ami'ad (UG)	14. 4. 69	119	-	-	10
Beit Gamliel (CP)	24. 4. 69	57	38	-	-
Deganyia (JV)	29. 5. 69	100	-	8	64
Ashdot Ya'akov (JV)	29. 5. 69	73	-	-	12
Ashdot Ya'akov (JV)	29. 6. 69	267	-	-	86
Kefar Gil'adi (UG)	3. 7. 69	25	-	3	6

