SEX RATIO OF RED PALM WEEVIL *RHYNCHOPHORUS FERRUGINEUS* OLIV., CAPTURED FROM DATE PLANTATIONS OF SAUDI ARABIA USING PHEROMONE (FERROLURE) TRAPS

The Kingdom of Saudi Arabia, is a major date producing country in the world with an annual production of 0.6 million tonnes (Anonymous, 1995). Since 1998 the red palm weevil, *Rhynchophorus ferrugineus* Oliv. is reported as a major pest of the date palm in the Kingdom. Initial attempts to control the pest with insecticides were not successful (Bokharu and Abozuhairah, 1992) and since 1994 an Integrated Pest Management (IPM) strategy, modelled on the lines of tackling the pest on coconut in India was implemented in the kingdom. This IPM strategy has successfully suppressed the pest in the date plantations of Saudi Arabia (Abraham *et. al*, 1998).

One of the major components of the above IPM strategy was the use of pheromone (Ferrugineol) traps, used to capture and kill the floating weevil population.

Hallett *et. al.* (1993), first synthesized the male produced aggregation pheromone Ferrugineol' (4-methyl-5-nonanol) capable of attracting adults of *R. ferrugineus*.

In Al-Hassa, the prestigious date palm growing centre of the Kingdom, pheromone traps have been used since 1994 to (i) monitor weevil activity in the vast stretches of date plantations (ii) mass trap the adult weevils in hot spots and (iii) make periodic assessment on the impact of the IPM strategy adopted in combating the pest (Faleiro *et. al.*, 1998)

During 1994, the Ministry of Agriculture and Water fabricated plastic bucket traps of five-litre capacity to trap palm weevil adults. The pheromone sachet was hung inside the bucket from the center of the lid. About 1 kg food (date palm stem bits) and 1 litre insecticide solution (0.1 per cent carbary1) was added to the trap. Traps were hung on palms 1.5 m above the ground. Initially in the mass trapped areas a trap density of one trap per 3.22 hectares was maintained. Subsequently, the trap density in the mass trapped areas was doubled, so that one trap served an area of 1.61 hectares. In the monitor areas, which were traditionally uninfested, one pheromone trap was set to serve approximately 100 hectares.

Since, the middle of 1994 when the trapping programme was first incorporated into the IPM strategy in Al Hassa, the number of traps in the field were gradually increased from 1133 during December, 1994 to 2907 traps by the end of 1997. All traps were serviced at weekly intervals, when the food bait and insecticide solution was replaced and also, counts on the number of weevils captured were recorded. In any insect trapping programme, it is desirable to capture more number of females, as the adult female contributes directly to the population build up by laying eggs, which hatch into the damaging nymphal or larval stage. It is reported that a single female of red palm weevil can lay upto 500 eggs during a life span of 2-3 months (Rahalkar *et. al*, 1972 and Lever, 1969).

To know the sex of the weevils captured by the pheromone traps from date plantations of Al-Hassa; all the weevils trapped between mid 1994 and December 1997 were sexed through visual observation. Male weevils had a distinct tuff of hair on the dorsal tip of the snout, while

female weevils have smooth snouts without any hair. Results pertaining to the sex ratios of weevil captures from different operational areas of Al-Hassa and also the monthly male and female weevil captures during the above period are discussed below.

From Table 1 it is encouraging to note that weevil captures in Al-Hassa using pheromone traps were female dominated, where as in nature, male to female population was reported as 1.32 : 1 (Nirula, 1956). In this study the weevil captures in different operational areas between mid 1994 to December, 1997 varied from 1 : 2.35 to 1 : 3.06, with an overall average of 1 : 2.68 in favour of females (Table 1). As the captures were female dominated, pheromone trapping along with other components of the IPM strategy contributed in suppressing the build up of the pest. This is supported by the fact that the total number of weevil trapped during 1997 reduced to 3806 as compared to 5308 and 5533 weevils captured in Al-Hassa during 1995 and 1996, respectively. In this context it is relevant to point out that Oechlschlager, *et. al*, 1995, obtained over 90 percent reduction in weevil captures of *R. palmarum* after two years of pheromone trapping in oil palm plantations of Costa Rica. Here too, the captures were female dominated.

Analysis of the data on a monthly basis between 1995 and 1997 showed that the overall sex ratio for the period was 1 : 2.7 in favour of females. The highest female activity was during the months of September and October, when 3.71 and 3.31 weevils were trapped, respectively for every male weevil captured. This was followed by a second high in activity of female weevils, during May when the male : female ratio of the trapped weevils was 1 : 2.83.

As the female weevils develop inside infested palms which also harbour male weevils, it can be inferred that most of the females captured by the pheromone traps had already mated within the infested palm itself and that the trapped female weevils flew out in search of a suitable site for egg laying. It may be noted that Ferrolure is an aggregation and not a sex pheromone. Thus, the trapped female weevils were most probably in search of a host for egg laying. Hence, the dominance of females captured in pheromone traps using the aggregation pheromone, besides monitoring the activity of the pest also contributed substantially in reducing the palm weevil population.

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Table. 1 Monthly male and female weevil captures in Al - Hassa, between 1995 to 1997

Month	Number of weevils captured								Sex Ratio (M : F)
	1995		1996		1997		Total		
	M	F	M	F	M	F	M	F	
January	67	170	85	149	23	158	175	477	1 : 2.73
February	63	143	81	192	37	133	181	468	1 : 2.59
March	76	214	172	469	63	188	311	871	1 : 2.80
April	188	457	123	232	94	267	405	956	1 : 2.36
May	177	429	245	797	118	300	540	1526	1 : 2.83
June	190	439	154	434	91	250	435	1123	1 : 2.58
July	135	257	126	354	84	219	345	830	1 : 2.41
August	77	206	72	186	83	207	232	599	1 : 2.58
September	80	289	69	238	100	398	249	925	1 : 3.71
October	182	479	107	414	81	331	370	1224	1 : 3.31
November	270	482	120	385	65	171	455	1038	1 : 2.28
December	81	157	78	251	98	247	257	655	1 : 2.55
Total	1586	3722	1432	4101	937	2869	3955	10692	1 : 2.70
Sex Ratio	1 : 2.34		1 : 2.86		1 : 3.06		1 : 2.70		

M - Male
F - Female

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