

## PREFERED HOST PLANT, FLOWERS AND TRAP COLOURS TO *TROPINOTA SQUALIDA* SCOP ADULTS (COLEOPTERA: SCARABAEIDAE)

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### **Abstract**

In newly reclaimed areas of the Arab Republic of Egypt, *Tropinota squalida* Scop. attack both fruit trees and field crops. And considered as the most district to agriculture. During the last decades the population of *Tropinota squalida* Scop. tend to increase thus cause great damage to various plantations. The following points were considered to govern the changes in the population density of this insect pest.

Data obtained during the course of the present study indicate that broad bean is more suitable and attractive than the other hosts to adults of *T. squalida* while lupine, wild mustard, wheat, navel orange, pear are less attractive. Also, the highest average percentage of infestation of wild mustard and broad bean flowers were more than that of the adult hosts. Lupine, wheat, navel orange, pear and apple were showed as the less percentage of infestation.

The results clear also that, all flower colours of tested plants affected markedly the daily activity of adults. The average number of adults per m<sup>2</sup> counted on plants between 12-2 p.m. was used as indicator for daily activity. The role of flower colours expressed as number of beetles, yellow (wild mustard) flowers were seem to be more attractive for adults than white flowers (wheat, lupine, pear, navel orange) and rose coloured flowers (apple) during the years of study 1994, 1995 and 1996. For 1997 the case was the other day round and white coloured broad bean flowers and lupine were more attractive than yellow coloured flowers of wild mustard. Generally, colour of flowers seems govern adults attraction to a great extent.

Field experiments were also carried out by testing 5 colours blue, white, yellow, red and green of pan water traps placed in an experimental area under canola plants. Pan blue water traps proved to be the best colour for attracting the beetles either for monitoring or to control the insect.

## INTRODUCTION

The web rose chafer, *Tropinota squalida* Scop. (Coleoptera: Scarabaeidae) was recorded previously in Egypt and known as a serious pest to ornamental plants but its population was always below the economic threshold in valley lands, therefore no serious problems were foreseen (Alfieri, 1976). In recent years, the population of *T. squalida* outbreaked and caused great damage to various plantations. Although this scarabaeid pest has a wide host-range (Ali and Ibrahim, 1988), little is known about its role as an injurious pest that need to be assessed. Mohamed (1992) found that citrus flowers are less preferable to *T. squalida* adults than pear flowers but at the same time are not rejected, Lupine flowers seem to be less preferred to *T. squalida* adults than those of broad bean. Rezk *et al.* (1998) in a field study 1995 – 1996 at El-Kassasin and El-Khatatba, Egypt reported that *Tropinota squalida* adults preferred top parts of the apple tree of rosy flower, pear and citrus trees of white flowers. Haydar *et al.* (1993) found that the adults of *T. squalida* were attracted in reliable numbers to blue, white, yellow and green coloured traps with more number of adults trapped in blue plastic basin traps.

In newly reclaimed areas specially in El-Khattara and New-Salhia districts, Sharkia Governorate, Nubaria, El-Behara Governorate, Ismailia district, Ismailia Governorate, the beetles of *T. squalida* attack flowers of all plants, which emerge during mid of January until mid of May causing considerable damage and great losses. The flowers of field crops (broad bean, lupine, wheat), fruit trees (apple, pear, citrus), vegetables (cabbage, radish, turnip, rocket) and weeds (wild mustard, wild radish) are severely attacked by this pest.

## MATERIALS AND METHODS

### **The effect of colour and host plant preference on population activity of *T. squalida* adults :**

Field experiments were carried out in newly reclaimed area at New Salhia during flowering season of three fruit trees pear, apple and navel orange and fields crops; wheat, broad bean, lupine, the weeds; wild mustard and wild radish. The flowering fruit trees, field crops and weeds were examined during four successive seasons during 1994, 1995, 1996 and 1997.

**A- On fruit trees:** Two orchards were selected. It included three fruit species (pear and apple at New Salhia and navel orange at El-Khattara). Weekly samples were collected during flowering period from March till April at mid-noon visually. Maximum length, maximum width of each tree were taken to calculate the flowering peripheral zone according to (Maurizio 1954) formula:

$$\text{Area m}^2 = \frac{a \times b}{2} \times \mu$$

a = maximum length      b = maximum width       $\mu = 3.14$

then number of insects/m<sup>2</sup> for tree was estimated according to the formula :

$$\text{insect/m}^2 = \frac{\text{Total insects / tree}}{\text{Total area of tree m}^2}$$

The flowers colour of the three fruit trees were;

Apple = rose

Pear = white-greenish

Navel orange = milk-white

Ten trees were selected randomly for each fruit species and the numbers of attracted adults were calculated.

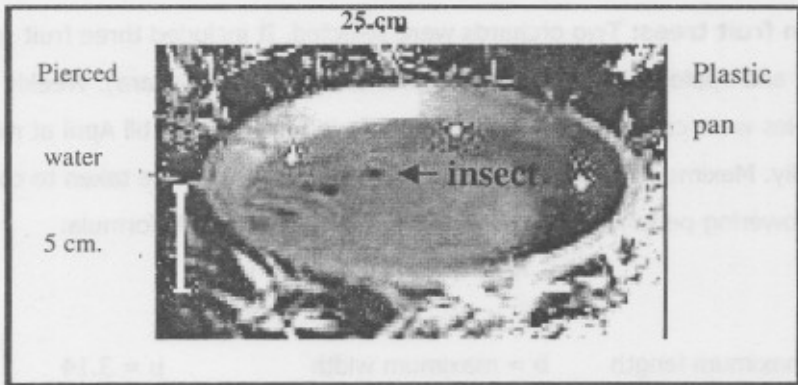


Fig 1. Blue pan water trap.

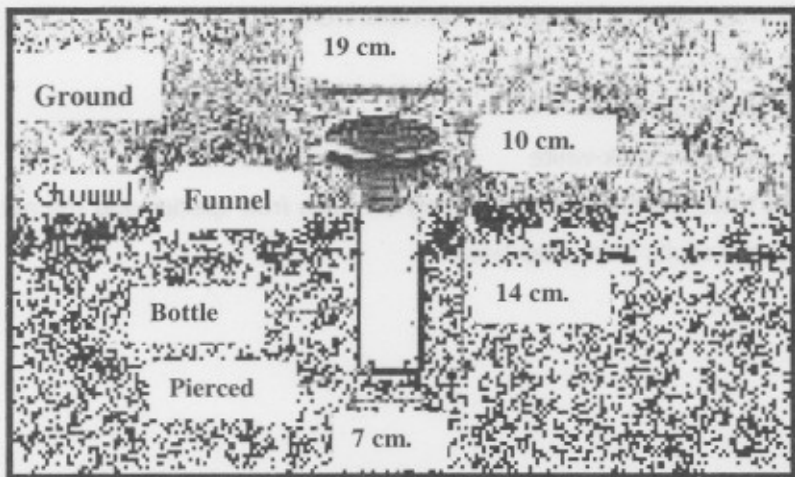


Fig 2. Blue funnel trap.

**B- On field crops and associated weeds:** Three field crops were selected at New Salhia namely, wheat, broad bean, lupine and the weed wild mustard the field crops and wild mustard were investigated during the flowering period from February to April for 4 successive seasons 94-1997. The weekly samples of attracted adult beetles *T. squalida* were collected and counted visually at mid-noon.

Ten plots (25m<sup>2</sup> each) were randomly selected from each crop, then the number of adult beetles per square meter were calculated by dividing the number of insects / plot by 25

$$\text{Mean number of insects / m}^2 = \frac{\text{Total insects / plot}}{25}$$

The recorded colour of flowers were: wheat (white), lupine (white-blue), broad bean (white-point black) and wild mustard (yellow)

The adults attracted to the fruit trees and field crops were counted visually, collected weekly at mid-noon and sexed. In addition, 100 flowers of each infested fruit tree species or crop were examined to estimate the relative preferential of *T. squalida* adults.

**C- The effect of colour pan water traps:** Five colours, i, e. blue, red, green, yellow and white were tested. Pan water traps were distributed randomly in 5 groups, each group contain five colours Fig. 1, 2, The traps were sitted in field of canola plants (one feddan). Weekly trapped adults were collected throughout the period extended from mid-February till the end of April. The adult were sexed, counted and recorded.

## RESULTS AND DISCUSSION

### - The effect of host plants Preference of flower and trap colours

#### 1- Host plant preference

Host plant preferability on fruit and field crops species were measured by the daily total counts on plants and by using the relative percentage of infestation on different hosts expressed as percentage.

#### a- Host plant preference as indicated by number of attacked adults

Data represented in Table 1. indicated that broad bean flowers were more suitable and attractive to adults than other hosts, while lupine, wild mustard, wheat, navel orange, pear and apple are less attractive, the weekly average values of insect

numbers were 34.225, 12.95, 29.475, 6.625, 13.5, 16.075 and 18.025 beetles / sample (plot or tree), respectively.

### **b- Host plant preference expressed as percentage of damaged flowers**

Data presented in Table, 2. indicate that, the highest average percentage of infestation were observed in wild mustard followed by broad bean flowers, while lupine, wheat, navel orange, pear and apple were least infested. Where, The weekly mean percentage of infestation of flowers were 31.75%, 26.60%, 22%, 24.775%, 17.525%, 20.765% and 19.125%, respectively.

The obtained results were in agreement with those obtained by Mohamed (1992) who found that citrus flowers are less preferred to *T. squalida* adults than pear flowers while lupine flowers seem to be little pit preferred than those of broad bean. Abdel Fattah (1991) explained the host preference among the three leguminous crops, broad bean, lupine and peas during 1984-1985 and 1985-1986 and revealed that the broad bean was the most attacked leguminous crop by *T. squalida* adults.

**2- Flower colour preference:** Data presented in Table, 3. clear that all flower colours of tested plants affected markedly of the average number/m<sup>2</sup> of *T. squalida* on plants between 12 – 2 p.m, which used as indicator for daily activity.

Considering the role of flower colour on beetles attractiveness, yellow (wild mustard) flowers were more attractive to beetles than white flowers (wheat, lupine, pear, navel orange) or rose flowers of apple during 1994, 1995, and 1996. The obtained results are not in agreement with the findings of Ali and Ibrahim (1988), however during 1997 only white flowers of broad bean and lupine were more attractive for beetles than yellow flower of wild mustard. The results obtained during 1997 are not in agreement with those obtained by Ali and Ibrahim (1988), and Mohamed (1992).

Table 1. The changes in host plant preference of *T. squalida* to different seven host plants (1994-1997 seasons).

Mean values of insect numbers per sample (tree or plots)							
Hosts Year	Apple	Pear	Navel Orange	Wheat	Wild Mustard	Lupine	Broad Bean
1994	19.30	21.40	16.10	10.00	43.10	7.60	31.00
1995	13.00	12.90	4.20	3.40	11.10	5.70	7.00
1996	25.20	12.10	7.80	3.30	38.20	1.00	47.50
1997	14.60	17.90	25.90	9.80	25.50	37.50	51.40
Total	72.10	64.30	54.00	26.50	117.90	51.80	136.90
Mean ± s. d.	18.025 ± 5.479	16.075 ± 4.38	13.50 ± 9.652	6.625 ± 3.782	29.475 ± 14.32	12.95 ± 16.60	34.225 ± 20.189

Table 2. The changes in host plant preference of *T. squalida* expressed infestations of seven host plants flowers at New Salihia during 1994-1997 flowering seasons

Flower infestation %							
Hosts Year	Apple	Pear	Navel orange	Wheat	Wild mustard	Lupine	Bread bean
1994	16.88	18.98	18.00	23.00	32.00	19.40	30.40
1995	20.72	21.36	20.32	22.00	30.00	22.00	24.00
1996	19.56	19.74	19.46	25.20	30.40	22.20	25.00
1997	19.34	22.98	12.32	28.60	34.60	26.60	27.00
Total	76.50	83.06	70.10	99.10	127.00	90.20	106.40
Mean ± .d.	19.125 ± 1.614	20.765 ± 1.779	17.525 ± 3.599	24.775 ± 2.923	31.75 ± 2.087	22.55 ± 2.986	26.60 ± 2.823

In other words, there were three main colours attract adults of *T. squalida*, white was the first followed by yellow, and rosy. The adult attraction to this colour differed significantly. Plant For example, in case of white colour, the flowers of broad bean were more attractive (numbers of captured adults, visually or by traps) than, lupine, wheat and navel orange, The least attractiveness were found in pear flowers,

where the number of captured adults were 1.626, 0.731, 0.419, 0.106 and 0.029 adults/m<sup>2</sup>, respectively.

The yellow colour demonstrates similar results to that obtained by white. The rosy colour appeared to be the least attractive to adults in case of apple, (0.092/m<sup>2</sup>).

In general these results revealed that colour can not be only the climatic factor, for adults attraction, but some other factors must be taken in consideration, such as plant potentially volatile odour, natural dropping of flowers in the same area, influence of other insect pests not included in the present analyses, crowdeness rate of *T. squalida* adults, hosts in the same area and the distance between them, the time of capturing and environmental factors ..... etc.

Generally, colour of flowers might be considered as one of the main climatic environmental factors for adult attraction. The effective colour when arranged designedly adult attraction white comes first followed by yellow. This help us to use these colours in trapping system as a new and safe controlling methods for adult stage.

**3- Traps colour preference:** This field experiment was carried out by using 5 colours of pan water traps (blue, white, yellow, red and green) sited under canola plants. Data obtained during 2000 season and tabulated in Table, 4. clear that blue coloured traps attracted more adults than other tested colour trap, where the average number of captured adults were 3.55, 0.15, 0.08, 0.06, and 0.02 beetles / trap for blue, white, yellow, red and green colours, respectively. Therefor, blue pan water trap was considered as the best for adults attractiveness either for monitoring population density of adult or mass trapping of adults. Results are in agreement with the findings of El-Minshawy et al. (1989), El Deeb (1992), Ali (1993), Hasydar et al (1993); who found that the blue traps attracted considerable number of adults than the other colours.



Table 3. The changes in *T. squalida* preference to host plants during 1994 – 1997 flowering seasons.

Average number of adult <i>T. squalida</i> / m <sup>3</sup>									
Hosts	Bread bean	Wheat	Lupine	Pear	Navel orange	Apple	Wild mustard	Total	Mean
Colour Year	White	White	White	White	White	Rose	Yellow		
1994	1.378	0.667	0.340	0.036	0.136	0.098	1.916	4.571	0.653
1995	0.467	0.227	0.380	0.025	0.035	0.066	0.634	1.834	0.262
1996	1.727	0.220	0.070	0.024	0.066	0.128	2.183	4.418	0.631
1997	2.936	0.560	2.143	0.030	0.185	0.074	1.457	7.376	1.054
Total	6.508	1.674	2.924	0.115	0.422	0.366	6.190	18.99	2.600
Mean ± s.d.	1.627 ± 1.02	0.419 ± 0.229	0.731 ± 0.954	0.029 ± 0.005	0.106 ± 0.067	0.092 ± 0.027	1.548 ± 0.027	4.55 ± 2.26	0.65 ± 0.32

Table 4. Weekly numbers of the fluctuations in the captured *T. squalida* adults as indicated by different coloured pan water traps during 2000 season, Ismailia Research Station.

Average number															
T.colour	Blue			Red			Green			Yellow			White		
Sex Date	♂	♀	T.	♂	♀	T.	♂	♀	T.	♂	♀	T.	♂	♀	T.
Feb.16	0.8	1.8	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	1.4	2.8	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	2.0	2.2	4.2	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.2	0.2	0.4	0.2	0.6
March 8	1.0	2.6	3.6	0.0	0.2	0.2	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0
14	0.8	3.6	4.4	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.2	0.2	0.2	0.2	0.4
21	1.6	5.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
29	0.6	1.8	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.2	0.0	0.2
April 4	1.6	2.0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.4	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	10.2	21.8	32.0	0.4	0.2	0.6	0.0	0.2	0.2	0.4	0.4	0.8	0.8	0.6	1.4
Mean ± s.d.	1.13 ± 0.53	2.42 ± 1.37	3.55 ± 1.69	0.04 ± 0.13	0.02 ± 0.06	0.06 ± 0.14	0.0 ± 0.0	0.02 ± 0.06	0.02 ± 0.06	0.04 ± 0.08	0.04 ± 0.08	0.08 ± 0.1	0.08 ± 0.145	0.07 ± 0.10	0.15 ± 0.21
F. between traps			58.53 **												

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## التفضيل العوائلى و اللونى لأزهار النباتات وألوان المصائد لجعل الورد الزغبى

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تعرض الزراعات فى المناطق المستصلحة حديثاً فى جمهورية مصر العربية للإصابة بعدد من الآفات الحشرية أهمها بعض أنواع الجعال والتي تسبب كثيراً من الأضرار للزراعات منها جعل الخوخ ، الجعل ذو الظهر الجامد ، والجعل الزمردى وجعل النخيل وجعل الورد الزغبى التابعة لعائلة الجعال - رتبة غمدية الأجنحة ، وقد تمت الدراسة على جعل الورد الزغبى وهو من أكثر الآفات ضرراً فى مناطق الاستصلاح بمحافظتى الشرقية والإسماعيلية.

أجريت هذه الدراسة فى المناطق السابقة بالإضافة إلى منطقة عز الدين بمحطة بحوث الإسماعيلية - مركز البحوث الزراعية خلال أعوام ١٩٩٤ ، ١٩٩٥ ، ١٩٩٦ ، ١٩٩٧ وموسم ٢٠٠٠.

وأوضحت النتائج المتحصل عليها ما يأتى :

### ١- التفضيل العوائلى

يعد الفول البلدى من أكثر العوائل ملائمة وجذباً للحشرات الكاملة لجعل الورد الزغبى ، بينما الترمس والكبر والقمح والبرتقال أبو صرة والكمثرى والتفاح أقل جذباً. كذلك بلغ أعلى متوسط للنسبة المثوية للإصابة على أزهار كل من الكبر والفول البلدى أكثر من العوائل الأخرى ، بينما كانت الإصابة أقل تركزاً على الترمس والقمح والبرتقال والكمثرى.

### ٢- التفضيل اللونى للأزهار

توضح النتائج أن ألوان الأزهار للنباتات المختبرة كانت تؤثر بوضوح على النشاط اليومى لجعل الورد الزغبى حيث استخدم متوسط عدد الحشرات الكاملة / م<sup>٢</sup> للنباتات بين الساعة ١٢ - ٢ مساءً مقياساً للنشاط اليومى. اعتبر أن اللون الزهرة دور فى تحديد عدد الخنافس المنجذبة للأزهار الصفراء (الكبر) والتي كانت أكثر جذباً للخنافس عن الأزهار البيضاء (القمح ، الترمس ، الكمثرى ، البرتقال أبو صرة) أو الأزهار الوردية اللون (التفاح) خلال مواسم ١٩٩٤ ، ١٩٩٥ ، ١٩٩٦ ، بينما تميز موسم ١٩٩٧ فقط بأن الأزهار البيضاء للفول البلدى والترمس كانت أكثر جذباً للحشرات عن الأزهار الصفراء للكبر. عموماً كان لون الأزهار أحد العوامل الرئيسية العديدة لجذب الحشرات الكاملة لجعل الورد الزغبى. وبصفة عامة وجد أن أهم الألوان لجذب الحشرات الكاملة كانت الأبيض والأصفر.

## ٣- التفضيل اللوني للمصائد

تمت التجارب باستعمال ٥ ألوان هي (الأزرق - الأبيض- الأصفر - الأحمر - الأخضر) للمصائد المائية الطبقية التي وضعت تحت نباتات الكانولا في منطقة التجربة. وثبت أن المصائد المائية الزرقاء الطبقية كانت أفضل الألوان المستعملة لجذب الحشرات الكاملة لجعل الورد الزغبي.