

Journal of Plant Protection and Pathology

Journal homepage & Available online at: www.jpmp.journals.ekb.eg

The Role of Some Factors Affecting Infestation of Certain Host Plants by *Sinoxylon sudanicum* Lesne Beetle (Coleoptera: Bostrichidae).

Batt, M. A.^{1*} and Nehal O. Swelam²

¹Plant Protection Research Institute, Agric. Research Centre, Dokki, Giza, Egypt.

²Econ. Entomol. & Agric. Zoology Dept., Faculty Agric., Menoufia Univ., Egypt.

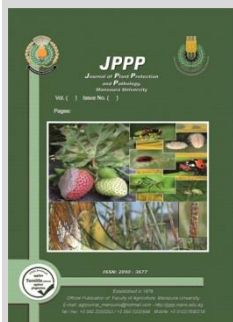


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ABSTRACT

The present work was carried out to study the effect of infestation type, host plant, moisture content, chemical components and prevailing conditions of temperature and relative humidity as well as natural enemies on the infestation of beetle, *Sinoxylon sudanicum* Lesne (Coleoptera: Bostrichidae) to nine host plants. Intact branch cuttings were collected from *Cassia fistula*, *Poinciana regia*, *Cassia renigera*, *Ficus sycomorus*, *Morus alba*, *Mangifera indica*, *Sailxae gyptiace*, *Casuarina equisetifolia* and *Eucalyptus citriodora* trees, and transferred to laboratory to study the points of article. The obtained data, reported that the obligatory infestation detected that *Cassia fistula* attracted the highest number of beetles (7.93 beetles) and gave the highest number of emerged beetles (24.53 beetles), while it showed the lowest duration of generation (50.7days), whereas, *Mangifera indica* attracted 3.13 beetles and gave 9.3 beetles and recorded the longest duration of generation 81.2days. Facultative infestation showed that the highest percentage of infestation (27.2%) recorded for *Cassia fistula*, while the lowest infestation percentage 6.67% recorded for *Morus alba*. The suitable moisture content to infestation was varied from 46.45% to 11.61% for *Cassia renigera*, while the minimum value recorded 7.78% for *Cassia fistula*. The infestations were decreased with the increasing in phenol content, while duration of generation for beetles increased with increased phenol content. The host plant with high content of carbohydrate (*Cassia fistula*) infested by highest number of beetles (7.93beetle) and gave the highest number of emerged beetles. *S.sudanicum* beetle emergence is accompaniment for predator beetle *Tarsostenus univittatus* (Fam.: Cleridae).

Keywords: *Sinoxylon sudanicum*, host preference, chemical contents, moisture content *Tarsostenus univittatus*, predator



INTRODUCTION

Sinoxylon sudanicum Lesne is one of wood boring insects of family Bostrichidae, order Coleoptera, which belong to powder post beetles group, because of the ability of the larvae to reduce sapwood into a powder frass. The beetles infested several hosts of wood and fruit variety trees. The important effective factors on activity of the infestation by *S. sudanicum* beetles are: type of host plant, chemical components of different hosts, moisture content of attacked hosts, the time from year (temperature and relative humidity) and natural enemies. Bostrichids are widely distribution in many countries of the world. Several researchers carried out variety works on *S. sudanicum* and the other beetle species of genus *Sinoxylon*, such as, Ayyar and Margabndhu (1944), Poggi *et al* (1994), Krishna and Margabanhy (1945), Rai and chatterjee (1963), Filho *et al* (2006), Nair (2007), Quiroz-Gamba and Sepúlveda-Cano (2008), Savoldelli and Regalin (2009), Chase *et al.* (2012), Lykidis *et al.*(2016) and Boriani *et al.* (2019). In Egypt, *S. sudanicum* beetle is extensive infestation in different Egyptian governorates. Several studies were conducted by some researchers, such as, Nour (1963), Hindy (1965), Helal (1969 & 1976), Ezzat *et al.* (1975), Moussa (1977), Okil (1982), Helal *et al.* (1985), Batt (1989) and Haggag(1991), Mohamed (2002) and Batt (2008) who detected that registered host plants for *S. sudanicum* were royal poinciana (*Poinciane regia* Boj), Egyptian acacia (*Acacia arabica*

Willd), black mulberry (*Morus nigra* L.), sisso (*Dalbergia sisso* Roxb.) sponge tree (*Acacia fornesiana* Willd), Egyptian willow (*Sailx aegyptiaca* L.), lebbek tree (*Albizzia elbbek* Willd), pink rose tree (*Cassia nodosa* L.), sesban (*Sesbania acultata* Pior.) , log wood (*Heamatoxylon campechianum* L.) , Common fig tree (*Ficus carica* L.), Casuarina (*Casuarina equisetifolia* L.), bamboo (*Bamusa arundinacea*), Mango (*Mangifera indica* L.), Jerusalem thorn (*Parkeonia aculata* L.), pecan (*Carya illinoensis* Wangenh.), poplar (*Populus tremuloides*), citrus tree , guava (*Psidium guajava* L.), castor oil (*Ricinus communis* L.), apple (*Malus domestica* Borkh.), grapevine (*Vitis vinifera* L.), Tamarsik (*Tamarix aphylla* L.), zanzalkhat (*Melia azedarach* L.) and ziziphus (*Ziziphus vulgaris* Lam.) trees. Batt (2005) found that *Tarsostenus univittatus* was predator of some borers of family Bostrichidae (*Dinoderus minutes*, *Enneandesmus* spp., *Sinoxylon sudanicum*, *Lyctus brunneus*, *Lyctus impressus* and *Lyctus africanus*). Ali (2013) carried out biological studies for *T. univittatus* predator on infested wood with *Lyctus africanus* Lesne (Coleoptera: Lyctidae).

From the previous review and the field observations on the tress cultivated in the Faculty of Agriculture, at Shebin El-Kom, Menoufia governorate showed heavily infestation for different tress by *S. sudanicum* beetles to different tree species resulting severe damage for trees, this article was under taken to study the role of some factors affecting infestation with beetle, *S. sudanicum* to host plants.

* Corresponding author.

E-mail address: d.mohammed_batt@yahoo.com

DOI: 10.21608/jppp.2022.222033

MATERIALS AND METHODS

The present study was carried out in trees cultivated at the farm of agriculture faculty (30.3328.4°N, 31.0054.8°E), at Shibeh El-Kom, Menoufia governorate, Egypt.

Infestation activity of *S. sudanicum* beetle:

Obligatory infestation.

Intact cuttings from different host plants with 25 Cm. long and 2.5 Cm. diameter collected at the same time from *Cassia fistula*, *Poinciana regia*, *cassia renigera*, *Ficus sycomorus*, *Morus alba*, *Mangifera indica*, *Salix aegyptiaca*, *Casuarina equisetifolia* and *Eucalyptus citriodora* trees. The collected cuttings were transferred to laboratory of Economic Entomology & Agricultural Zoology Dept., Faculty of Agriculture, Menoufia University. These cuttings were put in glass Jars (30cm x18cm), each contain on 5 cuttings of one solitary host and provided with 25couples of *S. sudanicum* beetles. Three replicates of each Jar were carried out. Daily observation was made and entrance holes were counted on different hosts, the emergence holes and generation duration of beetles on different hosts were calculated.

Facultative infestation.

Healthy cuttings of following trees: *Cassia fistula*, *Poinciana regia*, *cassia renigera*, *Ficus sycomorus*, *Morus alba* and *Mangifera indica*, each with 25 cm. long and 2.5 cm. diameter were collected at the same time and transferred to the laboratory, these cuttings were used to estimate the effect on attraction of beetles. Three cuttings from each host were put simultaneously in glass Jar (each with 30cm high and 18cm diameter), covered with muslin cloth, 5 jars were used and each Jar was provided with 100 couples of beetles. Daily observation was made and number of beetles entrance holes counted in each cutting, of each host, and the total number of entrance holes of each host was calculated

Effect of moisture content of host plants at different periods:

The equal cuttings of different host species (each about 50 cm. long and 2.5 cm. diameter) were collected from *Cassia fistula*, *Poinciana regia*, *Cassia renigera*, *Ficus sycomorus*, *Morus alba* and *Mangifera indica* trees and transferred to the laboratory. These cuttings were left for different periods (28, 21, 14, 7, 3days). Ten cuttings of each host were divided into 2 equal partition (25 cm. long), the first partition of cuttings used to determine the percentage of corresponding moisture content for the different cut periods of tested different host plants by using heat oven adjusted at 105 C° even weight stabilization of cutting aboutly.

The percentage of moisture content (MC%) was calculated as following equation:

$$MC\% = \frac{\text{Fresh wood weight} - \text{dry wood weight}}{\text{Fresh wood weight}} \times 100$$

While, the second partition of cutting put in glass jar (30cm x18cm), covered with muslin cloth and used to determine the number of attracted *S. sudanicum* beetles by exposure to 50 couples of beetles for each host, the number of entrance holes of beetles attracted to different hosts at different periods were recorded.

Effect of chemical components for host plants on attractive and life duration of *S. sudanicum* beetle:

Samples from used host cuttings to study the beetle's activity were chemical analysis to estimate each of level phenols, carbohydrate contents and the percentage of each protein, cellulose, fibers and ash in effect on entrance and emergence beetles as well as duration of generation of *S. sudanicum* on different hosts, so three cuttings of each host plants collected and transferred to laboratory of Plant Physiology Department, Faculty of Agriculture, Menoufia University. The chemical analysis was carried out according to the methods reported by AOAC (2000).

Role of natural enemies on emergence activity of *S. sudanicum* beetle:

The continuous observations on infested *Cassia fistula* cuttings discovered the existence for predatory beetle *Tarsostenus univittatus* Rossi., Family Cleridae, is accompaniment to powder post beetle, *S. sudanicum*. The emergence activity of beetles and predators was estimated by the emerged numbers during the period from 1st week of January until the 4th week of December 2021. So that, Infested branches from *Cassia fistula* trees were collected monthly and transported to the laboratory. Then the branches were divided to cuttings, each cutting with 25cm long and 2.5cm diameter. Ten infested cuttings put in glass ((30cm x18cm), covered with muslin cloth and replicated 5times .weekly inspection was carried out to recorded emerged beetles and predators, the monthly emergence was determined. The relationship between each of emerged beetles, predators and whether factors were studied.

Statistical analysis:

Obtained data during the study in this work were Statistical analyzed by SAS program (2001).

RESULTS AND DISCUSSION

Infestation activity of *S. sudanicum* beetle for different host plants:

Infestation activity of *S. sudanicum* beetle was determined by entrance and emergence holes as well as generation period on the different hosts in obligatory infestation and definition the preference hosts for beetle

Obligatory infestation.

Entrance holes, emergence holes and duration of generation for *S. sudanicum* beetles obligatory reared on different hosts (Table 1) detected highly differences between infestation activity on different hosts (F= 34.3, 54.12 and 343.66 of each Entrance holes, emergence holes and duration of generation, respectively). Statistical analysis showed 6 groups for entrance holes, 4 groups for emergence holes and 6 groups for duration of generation. *Cassia fistula* attracted the highest mean number of beetles (7.93 holes) and gave the highest mean number of beetle emergence (24.53 holes), while showed lowest mean generation period (50.7days). *Salix aegyptica* and *Casuarina equisetifolia* attracted the minimum mean number of beetles (1.93 and 1.27holes, respectively). *Mangifera indica* gave the lowest mean emergence holes (9.3 holes), while this host showed the highest mean generation period (81.2 days).The emergence holes for tested hosts detected 4 Statistical groups (LSD= 2.38), while duration of generation for tested hosts showed 6groups (LSD= 1.99).

Facultative infestation.

Data in Table (2) cleared that number of entrance holes on different hosts results selection the beetles to the suitable host.

The highest percentage of infestation in tested hosts was 27.21% for *Cassia fistula* followed by 21.62% for

Poinciana regia, 19.28% for *Cassia renigera*, 13.96% for *Ficus sycomorus*, 11.53% for *Mangifera indica*, while *Morus alba* listed the lowest percentage (6.67) for entrance holes. Six statistical groups were found between means number of entrance holes on different host plants, (LSD = 0.73).

Table 1. Effect of obligatory infestation by *S. sudanicum* beetle for different host plants estimated by entrance holes, emergence holes and duration of generation.

Host plants	Entrance holes		Emergence holes		Duration of generation (day)	
	Range	Mean + SD	Range	Mean + SD	Range	Mean + SD
<i>Cassia fistula</i>	6 - 10	7.93 ± 1.22 a	12-33	24.53 ± 4.73 a	47-54	50.7 ± 2.28 f
<i>Poinciana regia</i>	4 - 10	6.33 ± 1.88 b	11-28	22.13 ± 4.67 b	50-59	55.6 ± 2.80 e
<i>Cassia renigera</i>	4 - 8	5.93 ± 1.53 b	9-21	16.67 ± 3.33 c	55-64	61.5 ± 2.72 d
<i>Ficus sycomorus</i>	2-9	4.73 ± 1.90 c	11-18	12.73 ± 1.90 d	68-76	71.67 ± 2.79 b
<i>Morus alba</i>	2-7	3.93 ± 1.39 d	8-14	10.73 ± 1.87 d	60-69	65.27 ± 2.81 c
<i>Mangifera indica</i>	1-6	3.13 ± 1.51 e	8-12	9.3 ± 1.40 d	78-86	81.2 ± 2.96 a
<i>Salix aegyptica</i>	0-6	1.93 ± 1.62 f	-	-	-	-
<i>Casuarina equisetifolia</i>	0 - 2	1.27 ± 0.59 f	-	-	-	-
<i>Eucalyptus citriodora</i>	-	-	-	-	-	-
F		34.31		54.12		243.66
LSD		0.67		2.38		1.99

Table 2. Facultative infestation by *S. sudanicum* beetle for host plants estimated by entrance holes

Host plants	Number of entrance holes		Infestation %	Statistical groups
	Range	Mean + SD		
<i>Cassia fistula</i>	6-10	8.39 ± 1.38	27.21	a
<i>Poinciana regia</i>	5-8	6.67 ± 1.20	21.62	b
<i>Cassia renigera</i>	4-7	5.94 ± 1.18	19.28	c
<i>Ficus sycomorus</i>	3-5	4.22 ± 0.79	13.96	d
<i>Mangifera indica</i>	2-4	3.56 ± 0.90	11.53	e
<i>Morus alba</i>	0-3	2.06 ± 0.84	6.67	f
F		78.35	-----	
LSD		0.73	-----	

Role of moisture content of host plants on attraction of *S. sudanicum* beetle:

Data in Table (3) detected the moisture content of host plants under study on different periods from estimated

cutting with number of attracted beetles affected by suitable moisture content for developmental stages of *S. sudanicum* beetles.

Table 3. Effect of the moisture content of host plants on attraction *S. sudanicum* beetles at different periods.

Host plants	Item	3days	7days	14days	21days	28 days	F	LSD
		Mean + SD	Mean + SD	Mean + SD	Mean + SD	Mean + SD		
<i>Cassia fistula</i>	M.C%	40.67 ± 0.83	33.38 ± 1.52	13.92 ± 1.66	9.47 ± 1.12	7.78 ± 0.76	1330.25	1.17
	E.H	1.47 ± 0.88 c	5.13 ± 2.63 a	3.27 ± 1.69 b	1.13 ± 0.81 c	0.73 ± 0.68 c	22.79	1.08
<i>Poinciana regia</i>	M.C%	-	44.42 ± 2.55	33.66 ± 1.79	14.31 ± 1.33	10.22 ± 0.78	947.88	1.18
	E.H	-	1.93 ± 1.39 b	4.87 ± 1.82 a	2.47 ± 1.58 b	1.33 ± 0.87 b	24.41	1.17
<i>Cassia renigera</i>	M.C%	-	46.45 ± 2.25	24.69 ± 0.59	16.56 ± 2.05	11.61 ± 0.59	974.88	1.80
	E.H	-	1.27 ± 1.29 b	4.73 ± 1.81 a	2.13 ± 0.88 b	1.07 ± 0.68 b	25.83	0.94
<i>Mangifera indica</i>	M.C%	-	32.37 ± 1.29	15.46 ± 1.70	11.83 ± 1.16	8.60 ± 0.67	626.89	1.20
	E.H	-	3.27 ± 0.44 a	2.07 ± 0.70 b	1.4 ± 0.51 c	1.06 ± 0.59 c	43.07	0.42
<i>Ficus sycomorus</i>	M.C%	-	-	22.71 ± 2.34	9.9 ± 0.17	8.74 ± 0.48	284.43	1.33
	E.H	-	-	3.73 ± 1.57 a	1.73 ± 1.29 b	1.47 ± 0.81 b	13.50	0.96
<i>Morus alba</i>	M.C%	-	44.1 ± 1.1	23.5 ± 2.57	16.65 ± 1.29	13.49 ± 0.81	681.24	1.51
	E.H	-	1.27 ± 0.85 b	3.13 ± 1.70 a	2.07 ± 0.93 b	1.53 ± 0.88 b	7.21	0.87

M.C % = Moisture content E.H = Entrance holes

Illustrated data showed that moisture content was significantly decreased for all hosts with increase the different periods after cutting branches. The moisture content after 7 days for cutting showed the highest infestation for *Cassia fistula* (5.13 beetles) and *Mangifera indica* (3.27beetles), while the highest infestation recorded after 14 days for cuttings of each *Poinciana regia* (4.87 beetles), *Cassia renigera* (4.73 beetles), *Ficus sycomorus* (3.73beetles) and *Morus alba* (3.13beetles). The lowest infestation (minimum numbers of entrance holes) were recorded for moisture content at 28 days after cuttings of the all hosts.

Statistical analysis for entrance holes on tested host plants detected those 3 statistical groups for each of *Cassia fistula* and *Mangifera indica*, while only 2 groups obtained for the other host plants.

The suitable range of moisture content to infestation the different host plants varied between 46.45 + 2.25 % to 11.61 + 0.59 % for *Cassia renigera* and 32.37 + 1.29 % to 8.60 + 0.67 % for *Mangifera indica* whereas the minimum value for suitable moisture content of infestation recorded 7.78 + 0.76% for *Cassia fistula*. Okil (1982) found that the averages of infestation by *S. sudanicum* were 3.4, 3.8, 4.6 and 4.4holes for 13.6, 26.7, 31.3 and 35.6 of moisture content for poinciana wood branches, respectively.

Effect of chemical components for host plants on attractive and life duration of *S. sudanicum* beetle:

Previous studies on the relation between the wood borers attack's and chemical components for host plants of wood borers (powder post beetles) detected the important role of some components in the wood such as, the starch content (Carbohydrates), amino acid, Cellulose, ash and

lignin Cymorek (1976), Simpson and Barteni (1991), Helal (1986), El-Sabay and Helal (1995).

Data illustrated in Table (4) showed that important components of different host plants were phenols, carbohydrates, proteins, cellulose, fibers and ash.

Role of phenols on the infestation:

1-On entrance and emergence beetles.

Levels of phenols in different hosts detected that the infestations were decreased with the increasing in phenol contents. *Cassia fistula* recorded the highest number of entrance holes (7.93 holes, Table 1) at phenol level 14.11 mg caticole/100gdwt. Table (4), while, *Casuarina equisetifolia* recorded 1.27 holes at phenol level 44.15 mg caticole/100gdwt, while no entrance holes were recorded in *Eucalyptus sp.* at phenol level of 45.21 mg caticole/100gdwt. In the same time emergence holes recorded the highest number on *Cassia fistula* (24.53 holes) and the lowest emergence (9.3holes) on *Mangifera indica*, while each of salix, Casuarina and Eucalyptus not recorded any emergence for beetles.

2- on duration of generation.

The obtained data on generation duration of *S. sudanicum* beetle on different hosts were affected by phenol contents which indicated that the generation duration of these beetles increased with increasing phenols contents. The duration of generation recorded 50.7 days on *Cassia fistula* when the phenol content was 14.11 mg caticole/100gdwt, while the duration increased to 81.2days when phenol content recorded 27.24 mg caticole/100gdwt. in *Mangifera indica* cuttings.

Role of carbohydrate on the infestation:

Data recorded in Table (1&4) detected that each of entrance holes, emergence holes and generation duration of *S. sudanicum* beetle differed in different hosts according to

carbohydrate content in different hosts, the chemical components of host plants showed that *Cassia fistula* contain the large amount of carbohydrate (429.81 mg/gdwt.) and infested with the highest number of beetles(7.93) and appeared the highest number of emergence beetles (24.53 emergence holes) , while the lowest amount of carbohydrate recorded for *Salix aegyptica* (254.74 mg/gdwt) and *Casuarina equisetifolia* (250.62 mg/gdwt) and showed the minimum number of entrance holes(1.93 & 1.27 holes respectively), whereas not produce any emergence holes.

The duration of generation was increased with decreased carbohydrate content of different hosts. The highest amount of carbohydrate (429.81 mg/gdwt) appeared the lowest duration of generation period (50.7days) for *Cassia fistula*, while *Mangifera indica* contain 258.38 mg/gdwt and recorded longest duration of generation 81.2 days

Role of protein, cellulose and fibers on the infestation:

Chemical components of host plants (Table 4) showed that the percentages of each protein, cellulose and fibers were differed for host plants under study.

The obtained data detected that the infestation activity was decreased with increase of percentage for each protein, cellulose and fibers for different hosts. The highest numbers of entrance and emergence holes recorded 7.49 and 24.53 holes, respectively at the lowest percentage of protein (4.68%) for *Cassia fistula*, while the lowest numbers for entrance and emergence holes were 3.13 and 9.3holes, respectively, at 8.40% protein for *Mangifera indica*.

Likewise, the same pervious number for entrance and emergence holes recorded of each cellulose and fibers at the minimum percentage 14.61 and 18.96 % for *Cassia fistula* and the highest percentages 22.72% and 26.47% for *Mangifera indica* of cellulose and fibers, respectively.

Table 4. chemical components for host plants of *S. sudanicum* beetle

Host plants	Phenols (mg caticole/100gdwt.)	Carb. (mg/gdwt.)	Protein (%)	Cellulose (%)	Fibers (%)	Ash (%)
<i>Cassia fistula</i>	14.11	429.81	4.68	14.61	18.96	1.66
<i>Poinciana regia</i>	14.73	406.27	4.79	15.16	19.46	1.69
<i>Cassia renigera</i>	17.87	306.42	5.97	15.63	21.70	1.78
<i>Ficus sycomorus</i>	22.94	306.28	6.85	19.04	22.96	2.05
<i>Morus alba</i>	24.59	278.35	8.08	22.47	23.54	2.37
<i>Mangifera indica</i>	27.24	258.38	8.40	22.72	26.47	2.41
<i>Salix aegyptica</i>	28.62	254.74	9.98	25.45	27.06	2.45
<i>Casuarinae quisetifolia</i>	44.15	250.62	11.25	27.93	29.81	2.57
<i>Eucalyptus citriodora</i>	45.21	247.36	11.94	28.19	30.65	2.78

Emergence activity of *S. sudanicum* beetle and *T. univittatus* predator under prevailing weather factors:

Data on emergence of *S. sudanicum* beetle and *T. univittatus* predator under the effect of dominant weather factors (Temp. & RH %) are represented in Fig (1). The highest weekly number of emerged beetles was 314beetles recorded during the 3rd week of July followed by 201 beetles during the 2nd week of July, then the 1st of August (190beetles), the 4th week of each September (128 beetles) and July (100 beetles). The lowest number of beetles emergence was 2 beetles only recorded during each 4th week of January, 1st &3rd week of February and 4th week of December whereas the highest number of predators recorded during the 3rd week of July (131predtors), the 4th week of July (115predtors) , the 1st week of August (101predtors),while the minimum number of predators was only one recorded during each of 2nd & 4th week of February and 2nd week of March then two predators were emerged at 1st week of September.

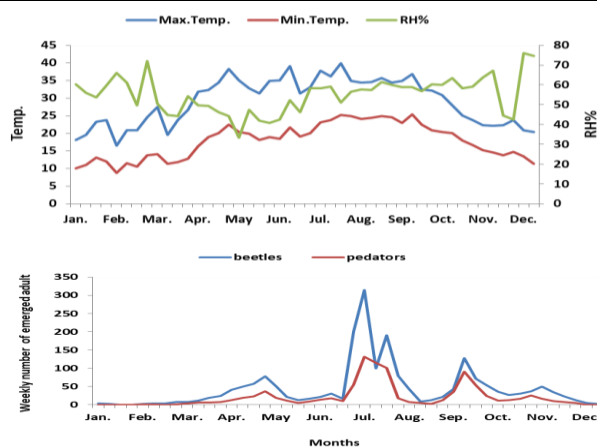


Fig. 1. Weekly numbers of *S. sudanicum* beetle and *T. univittatus* predator emerging from infested *Cassia fistula* cuttings with corresponding Temp.& R.H during 2021 year at Menoufia governorate.

The relationship between each of emerged beetles, predators and weather factors:

Data of monthly numbers and emergence percentages for *S. sudanicum* beetle and *T. univittatus* predator are presented in Table (5), the results detected that the highest monthly number of emerged beetles were recorded during July (632beetles followed by August (321beetles) then May (207 beetles), September(205beetles), while the minimum monthly number was recorded (20 beetles) during January, whereas the highest monthly number of emerged predators was recorded (311predators) during July followed by 142 predators during September,132 during August and 101 during October , while the minimum monthly numbers were recorded during February (2 predators) and each of January & March (6 & 11 predators) respectively.

The percentages of monthly emergence during study period showed that the highest monthly parentages of beetles recorded during July 31.41%, August 15.95 and each of May 10.29% and September 10.19%, while the highest monthly percentages of predators were observed during July 31.51%, September 14.39%, August 13.37% then October 10.23%. The lowest percentage of beetles emergence were recorded as 0.25% and 0.99% while it was recorded 0.20 and 0.16% for predators, during February and January respectively.

As shown in Table (5), the proportion between the beetles and predators was the highest during January (3.33:1) and December (3.23:1) while the minimum proportion appeared during September (1.44:1), November (1.70:1), June (1.76:1) and October (1.85:1).

Table 5. Monthly emergence for *S. sudanicum* beetle and *T. univittatus* predator from infested *Cassia fistula* cuttings during 2021 year.

Month	Monthly number		Proportion		Emergence monthly percentage	
	Borer	Predator	Borer : Predator	Borer	Predator	
January	20	6	3.33 :1	0.99	0.61	
February	5	2	2.50:1	0.25	0.20	
March	29	11	2.64:1	1.44	1.11	
April	133	45	2.46:1	6.61	4.56	
May	207	90	2.30:1	10.29	9.12	
Jun	81	46	1.76:1	4.03	4.66	
July	632	311	2.03:1	31.41	31.51	
August	321	132	2.43:1	15.95	13.37	
September	205	142	1.44:1	10.19	14.39	
October	187	101	1.85:1	9.29	10.23	
November	150	88	1.70:1	7.46	8.92	
December	42	13	3.23:1	2.09	1.32	
Total	2012	987	2.04:1	100	100	

The effect of three weather factors (Max.Temp, Min.Temp. and RH%) on the emerged number of each of *S.sudanicum* beetle and *T. univittatus* predator are clarified by simple correlation which showed moderate effect of maximum temperature and minimum temperature on beetles($r=0.545$ & 0.531) and predators ($r=0.570$ & 0.577), while no effect for RH% on beetles and predators, Table (6). The relationship between predators and beetles determined by correlation which was highly significant and positive ($r=0.889$), Table (6).

Table 6. Simple correlation (r), simple regression (b) of three weather factors (Min., & Max. Temp. and RH %) with the number of emerged *S. sudanicum* beetle and *T. univittatus* predator during 2021 years.

	<i>S. sudanicum</i> beetles		
	Max.Temp.	Min.Temp.	RH%
Simple correlation(r)	0.545	0.531	-0.015
simple regression (b)	4.879	6.358	-0.0979
<i>T. univittatus</i> predators			
	Max.Temp	Min.Temp	RH%
Simple correlation(r)	0.570	0.577	-0.004
simple regression (b)	2.617	3.538	-0.012
<i>T. univittatus</i> predators and <i>S. sudanicum</i> beetles			
Simple correlation(r)	0.8893		
simple regression (b)	1.735		

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دور بعض العوامل المؤثرة على الإصابة لبعض العوائل النباتية بواسطة خنفساء *Sinoxylon sudanicum* Lesne (Coleoptera: Bostrichidae)

محمد عبد الغنى بط¹ ونهال أمية سويلم²

¹معهد بحوث وقاية النباتات- مركز البحوث الزراعية - الدقى - الجيزة - مصر

²قسم الحشرات الإقتصادية والحيوان الزراعى - كلية الزراعة - جامعة المنوفية - المنوفية - مصر

يهدف هذا البحث الى دراسة تأثير نوع الإصابة ، نوع العائل النباتى ، محتوى رطوبة العوائل النباتية ، المكونات الكيميائية للعوائل المختلفة ، الظروف السائدة الحرارة والرطوبة النسبية بالإضافة الى الأعداء الطبيعية على اصابة خنفساء *Sinoxylon sudanicum* لتسعة عوائل نباتية . وقد أظهرت النتائج أن الإصابة الإجبارية بالخنفساء لفروع أشجار *Cassia fistula* جذبت العدد الأعلى للخنفساء (7,93) وأعطت أعلى عدد للخنفساء الخارجة (24,53) بينما أظهرت أقل فترة للجبل (50,7 يوم). أما *Mangifera indica* جذبت (3,13) خنفساء وأعطت (9,3) خنفساء وسجلت أطول مدة جبل (81,3) يوم . أما الإصابة الأختبارية فقد أظهرت النسبة المئوية الأعلى للإصابة (27,9%) سجلت على أشجار *Cassia fistula* بينما أقل مستوى للإصابة كان مع أشجار التوت *Morus alba* . واختلف المدى المناسب لمحتوى الرطوبة لإصابة العوائل المختلفة من (46,45) إلى (11,61%) فى أشجار *Cassia renigera* بينما سجل أقل محتوى رطوبة (7,78%) فى أشجار *Cassia fistula* . أما عن تأثير المكونات الكيميائية للعوائل النباتية على الجذب ومدة حياة خنفساء *S. sudanicum* فقد أوضحت النتائج أن الإصابة تكون متناقصة مع الزيادة فى محتوى الفينول بينما مدة الجبل للخنفساء زادت بزيادة محتوى الفينول . وكان العائل النباتى ذا المحتوى العالى من الكربوهيدرات مثل *Cassia fistula* قد أصيب بواسطة العدد الأعلى من الخنفساء (7,93) . وخرج خنفساء *S. sudanicum* كان مصاحباً له خنفساء مفترس *Tarsostenus univittatus* .