

# Succession of various insect pollinators/visitors visiting on niger crop (*Guizotia abyssinica* cass.)

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## ABSTRACT

Studies on the succession of various insect pollinators/ visitors on niger crop was undertaken during the Rabi 2011-12. Total 15 species of insect pollinators/ visitors were found visiting on niger flowers. Amongst the pollinators/visitors, *Apis cerana indica* appeared first on niger flower followed by *Apis florea*, *Danaus chrysippus*, *Eristalis* sp., *Pelopidas mathias*, *Apis dorsata*, *Musca domestica*, *Nazara viridula*, *Dysdercus cingulatus*, *Leptocoris acuta*, *Amata passalis*, *Chrysomya bezziana*, *Coccinella septempunctata*, *Vespa cincta* and *sarcophaga* sp. They were found visiting on niger flower throughout the blooming period.

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## INTRODUCTION

Niger (*Guizotia abyssinica* cass.) is an important oilseed crop which is cultivated in Ethiopia and India. The common name of niger sorguja (Bengali), sarguja (Oriya), alashi (Telugu), ramtal (Hindi) and ramtil in Punjabi of various regional Indian languages. It is a branched annual herbaceous plant, grows up to a height of 1.8 meter. The niger plant complete its life cycle in 3-4 months. The yellow flower heads of 2-3 cm develop in the leaf axil, in a cluster of two to five.

This crop is widely adopted to all types of soil in Chhattisgarh and also in India, it is commonly grown on poor and acidic soils or on hilly slopes that are very low in fertility. The area of this oilseed crop in Chhattisgarh is 1.08 lakh hectare with the production of 0.27 lakh tones and productivity is 260 kg ha<sup>-1</sup> (Anonymous, 2011).

There is good demand of niger seed in domestic as well as in foreign market due to its valuable use in different sector of agriculture and applied industries. The crop is totally

dependent on external agents for its reproductive development by way of pollination through external agencies particularly taking the help of insects that to the honey bee, which frequently visit flowers gathering pollens as well as nectar for sustaining their life, which in turns results into florets get cross pollinated (Bhambure, 1958).

## MATERIAL AND METHODS

The experiment was conducted at Raj Mohini Devi College of Agriculture and Research Station, Ambikapur of Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). It was upland, single plot keeping plot size 10×10m<sup>2</sup>, variety was JNC-9, spacing 30×10cm and was sown on 01/09/2011. The observations were recorded when the niger crop started flowering pollinators/ visitors were observed starting from 0700hrs up to 1700hrs at two hours intervals once every week, on randomly selected places from one square meter area within five minutes during early as well as peak flowering period.

## RESULTS AND DISCUSSION

During the course of the study, 15 species of insect pollinators/ visitors were recorded on niger flowers. Among them Indian honey bee (*Apis cerana indica*) was the first pollinator observed to pollinate on niger crop which visited the crop throughout the flowering period, other bee pollinators like *Apis florea* and *Apis dorsata* were also recorded. Besides, these some pollinators/ visitors viz., *Danaus chrysippus*, *Eristalis* sp., *Musca domestica*, *Nazara viridula*, *Dysdercus cingulatus*, *Coccinella septempunctata*, *Vespa cincta*, *Leptocoris acuta*, *Amata passelis*, *Pelopidas mathias*, *Sarcophaga* sp. and *Chrysomya* sp. were also recorded throughout the blooming period on niger crop (Table 1). The succession of pollinators/visitors were reported as under :

### Indian honey bee (*Apis cerana indica*) :

The *Apis cerana indica* was observed as a prominent pollinator of niger crop. Its first appearance on niger flower was observed in the second week of October with a mean population of 7.5 bees/5min/m<sup>2</sup>. The population of bees gradually increased during 3<sup>rd</sup> week of October 2011 (18.83 bees/5min/m<sup>2</sup>), 4<sup>th</sup> week of October 2011 (28.83 bees/5min/m<sup>2</sup>) and reached its peak population in 1<sup>st</sup> week of November (33.33 bees/5min/m<sup>2</sup>) thereafter, it continued to decrease during second week of November 2011 (30.83 bees/5min/m<sup>2</sup>), 3<sup>rd</sup> week of November 2011 (26.16 bees/5min/m<sup>2</sup>), 4<sup>th</sup> week of November 2011 (13.33 bees/5min/m<sup>2</sup>) and last week of November 2011 (6.5 bees/5min/m<sup>2</sup>). The mean population was 20.66 bees/5min/m<sup>2</sup>.

These findings corroborated the results of Singh and Chaudhary (2002) who recorded the insect visitors of ber mainly *Apis dorsata* (24.88 %), *A. cerana indica* (18.39 %) and *A. florea* (17.76 %) as flower visitors. Singh *et al.* (2006) who reported the foragers on litchi with higher population during the early flowering stage than during the mature flower stage of the crop. Among the foragers *A. mellifera* was predominant species (35.08 %) of insect visitors followed by *A. cerana indica* (18.64 %) and Kumar *et al.* (2010) reported the relative abundance of pollinators in cotton hybrid and indicated that the honey bees, *A. carana*, *A. dorsata*, *A. florea* constituted 65 to 70 per cent on CMS line and 75 to 78 per cent on R lines, at different times and different flowering density. Mohapatra and Sontakke (2012) also recorded hymenopterans visiting on sesamum namely *A. indica*, *A. dorsata*, *A. florea*, *Trigona irridipenis*, *Andrena* sp. *Bombus* sp. and *megachile* sp. as a regular visitors *dorsata* (13.38 %).

### Little bee (*Apis florea*) :

The first appearance of *A. florea* was observed in the 2<sup>nd</sup> week of October (1.83 bees/5min/m<sup>2</sup>). It slightly increased in third week of October (2.16 bees/5min/m<sup>2</sup>) and decreased during 4<sup>th</sup> week of October (1.00 bees/5min/m<sup>2</sup>) and again

increased during 1<sup>st</sup> week of November (3.33 bees/5min/m<sup>2</sup>) and decreased (1.66 bees/5min/m<sup>2</sup>) during second week of November and further increased (3.00 bees /5min/m<sup>2</sup>) in 3<sup>rd</sup> week of November. The maximum population of bees were recorded during 4<sup>th</sup> week of November (3.5 bees/5min/m<sup>2</sup>) and 1.5 bees/5min/m<sup>2</sup> were observed in 1<sup>st</sup> week of December. The average population of bees was 2.24 bees/5min/m<sup>2</sup>.

These results corroborated the early findings of several workers on different crops Nidagundi and Sattagi (2005) recorded *Apis florea* was the most predominant sp. in bitter gourd constituting 43.00 per cent followed by *Apis cerana* (26.00 %) and *A. dorsata* (13.00 %). Saeed *et al.* (2012) reported that *Apis florea* and *A. dorsata* also exhibited the highest visitation rates and frequencies on bitter gourd.

### Monarch butterfly (*Danaus chrysippus*) :

The activity of *Danaus chrysippus* was observed during 2011-12 with its first appearance in 2<sup>nd</sup> week of October, 2011 (0.66 monarch butterfly/5min/m<sup>2</sup>). The maximum population was recorded (0.83 monarch butterfly/5min/m<sup>2</sup>) during fourth week of October 2011. Thereafter, it disappeared during 1<sup>st</sup> week of November, 2011 with regain its population in 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> week *i.e.* 0.33 monarch butterfly/5min/m<sup>2</sup> with increasing trend in 1<sup>st</sup> week of December, 2011. The average population was 0.45 monarch butterfly/5min/m<sup>2</sup>.

The present results are in line with the findings of Dhakal and Pandev (2003) who observed that the butterflies visited the niger flowers through the flowering span. Dhurve (2008) recorded *Danaus chrysippus* (15.71 %) as a pollinators on niger flowers followed by *Apis dorsata* (37.23 %), *A. florea* (28.74 %), and *A. cerana indica* (18.32 %). Nath and Viraktamath (2010) also recorded eight species of pollinators on sunflower and among these, five species belonged to Hymenoptera and three species to Lepidoptera. Among Lepidoptera, *Danaus chrysippus*, followed by *Pieris* sp. and *Papilio demoleus* were recorded as major pollinators.

### Syrphid (*Eristalis* sp.) :

The *Eristalis* sp. was observed first (1.33 syrphid flies/ 5min/m<sup>2</sup>) in 2<sup>nd</sup> week of October. It increased in 3<sup>rd</sup> and 4<sup>th</sup> week of October, 2011 with respective population of 2.66 and 4.00 syrphid flies/5min/m<sup>2</sup> with its peak population in 1<sup>st</sup> week of November, 2011 (5.16 syrphid flies/5min/m<sup>2</sup>) and decreased population was observed in 2<sup>nd</sup> week of November, 2011 (2.00 syrphid flies/5min/m<sup>2</sup>). Further, it disappeared in 3<sup>rd</sup> and 4<sup>th</sup> week of November, and 1<sup>st</sup> week of December 2011. The average population was 1.89 syrphid flies/5min/m<sup>2</sup>.

These findings are in close conformity with the earlier reports of Atmowidi *et al.* (2007) who recorded the syrphid fly (2.07 %) on mustard. *Apis cerana* (43.11 %), *Ceratina* sp. (36.98 %) and *A. dorsata* (8.36 %) were found in high abundance.

Table 1 : The succession of various insect pollinators/ visitors on niger flowers during (2011-12)

Sr. No.	Pollinators/visitors	Scientific name	Order	Family	I	II	III	IV	V	VI	VII	VIII	Mean
1.	Indian honey bee	<i>Apis cerana indica</i>	Hymenoptera	Apidae	1 <sup>st</sup> appearance (7.5)	18.83	28.83	33.33Peak activity	30.83	26.16	13.33	6.5	20.66
2.	Little bee	<i>A. florea</i>	Hymenoptera	Apidae	1 <sup>st</sup> appr.(1.83)	2.16	1.00	3.33	1.66	3.00	3.5 Peak activity	1.5	2.24
3.	Monarchbutterfly	<i>Danaus chrysippus</i>	Lepidoptera	Danaidae	1 <sup>st</sup> appearance(0.66)	0.66	0.83Peak activity	0.00	0.33	0.33	0.33	0.5	0.45
4.	Syrphid fly	<i>Eristalis</i> sp.	Diptera	Syrphidae	1 <sup>st</sup> appearance (1.33)	2.66	4.00	5.16 Peak activity	2.00	0.00	0.00	0.00	1.89
5.	Rice skipper	<i>Pelopidas matinas</i>	Lepidoptera	Hesperiidae	1 <sup>st</sup> appearance (0.50)	0.50	0.50	0.66Peak activity	0.33	0.00	0.33	0.00	0.35
6.	Rock bee	<i>Apis dorsata</i>	Hymenoptera	Apidae	0.00	Ist appear. (4.16)	Peak activity (16.16)	8.83	3.00	3.33	0.00	0.00	4.43
7.	House fly	<i>Musca domestica</i>	Diptera	Muscidae	0.00	0.00	I <sub>st</sub> appear.2.50	0.50	2.00Peak	0.83	1.83	2.00	1.20
8.	Green sting bug	<i>Nazara vinidua</i>	Hemiptera	Pentatomidae	0.00	0.00	Peak activity I <sub>st</sub> appear (0.50)	0.00	0.83Peak activity	0.00	0.33	0.00	0.20
9.	Red cotton bug	<i>Dysdercus cingulatus</i>	Hemiptera	Pyrrhocoridae	0.00	0.00	I <sub>st</sub> appr. (0.33)	0.00	0.00	0.00	0.33	0.00	0.08
10.	Rice bug	<i>Leptocoris acuta</i>	Hemiptera	Alydidae	0.00	0.00	Peak activity I <sub>st</sub> appr(0.33)	0.33	0.00	0.33	0.00	0.00	0.12
11.	Tiger moth	<i>Anata passelis</i>	Lepidoptera	Amatidae	0.00	0.00	Peak activity I <sub>st</sub> appr(0.50)	0.33	0.33	0.00	0.00	0.00	0.14
12.	Blow fly	<i>Chrysomya bezziana</i>	Diptera	Calliphoridae	0.00	0.00	Peak activity I <sub>st</sub> appr. (1.16)	1.16	1.83Peak activity	0.66	1.66	0.00	0.80
13.	Lady bird beetle	<i>Coccinella septempunctata</i>	Coleoptera	Coccinellidae	0.00	0.00	0.00	I <sub>st</sub> appear. (0.50)	0.50	0.00	0.66Peak activity	0.66Peak activity	0.29
14.	Wasp	<i>Vespa cincta</i>	Hymenoptera	Vespidae	0.00	0.00	0.00	I <sub>st</sub> appr. (0.33)	0.33	0.50Peak activity	0.50 Peak activity	0.33	0.24
15.	Tachnid fly	<i>Sarcophaga</i> sp.	Diptera	Sarcophagidae	0.00	0.00	0.00	0.00	Ist appr.0.50	0.50Peak activity	0.33	0.33	0.20

**Rice skipper (*Pelopidas mathias*) :**

The *Pelopidas mathias* was first observed in 2<sup>nd</sup> week of October, 2011 (0.5 rice skipper/5min/m<sup>2</sup>) and similar population was recorded during the 3<sup>rd</sup> and 4<sup>th</sup> week of October, 2011. Whereas, the maximum population was observed in first week of November, 2011 (0.66 rice skipper/5min/m<sup>2</sup>) with decreased population in 2<sup>nd</sup> week of November, 2011 (0.33 rice skipper/5min/m<sup>2</sup>). Further, it was disappeared during 3<sup>rd</sup> week of November, 2011. It again appeared during 4<sup>th</sup> week of November, 2011 and further disappeared during 1<sup>st</sup> week of December, 2011. During the same year the average population was observed 0.35 rice skipper/5min/m<sup>2</sup>.

These findings are in more or less conformity with the earlier results of Chaudhary (2002) who observed that the moths and butterflies visited on ber accounted for 12.38 per cent, whereas, the other insects contribution was 26.58 per cent of the total flower visitors.

**Rock bee (*Apis dorsata*) :**

The initial population of rock bee was recorded in the third week of October, 2011 and gradually increased in fourth week of October, 2011 with population ranged from 3.00 to 16.16 bees/5 min/m<sup>2</sup> with its maximum population of 16.16 bees/5min/m<sup>2</sup> during fourth week of October, 2011. The population was disappeared in fourth week of November, 2011 and first week of December, 2011.

These findings are in conformity with the earlier workers on different crops, Chaudhary (2001) reported little bee, *A. florea* in most abundant form (42.8 %) on rapeseed followed by rock bee *A. dorsata* (16.6 %). Guruprasad (2001) reported the pollinators on niger in which *A. dorsata* (27.35 %) was the most prominent pollinators followed by *A. mellifera* (10.81 %), *A. florea* (4.88 %) and *A. cerana* (4.17 %).

**House fly (*Musca domestica*) :**

The activity of house fly was observed from fourth week of October to first week of December with the mean population of 1.20 house flies/5min/m<sup>2</sup> and its population ranged from 0.50 to 2.5 house flies/5min/m<sup>2</sup>. The house fly was peak on fourth week of October.

These results are in close conformity with the findings of Saeed *et al.* (2008) who recorded the pollinators on onion with effective bee specie *Apis dorsata* and *A. florea* which were greater than true flies, *Episyrphus balteatus*, *Eupeodes* sp., *Musca domestica* and *Eristalinus aeneus*.

**Green sting bug (*Nazara viridula*) :**

The first appearance of green sting bug was recorded in the fourth week of October with the population ranged of 0.33 to 0.83 green sting bug/5 min/m<sup>2</sup> with its maximum population of 0.83 green sting bug/5 min/m<sup>2</sup> as observed during second week of November.

The present results are in close agreements with that of Thapa (2006) recorded green sting bug an insect visitor visiting on buckwheat, radish and rapeseed flowers. Navatha and Sreedevi (2012) who reported *Nazara viridula* as visitor of castor with its relative abundance of 4.80 per cent.

**Red cotton bug (*Dysdercus cingulatus*) :**

The first appearance of red cotton bug was recorded during 4<sup>th</sup> week of October, 2011 (0.33 red cotton bug/5min/m<sup>2</sup>) with no population during 1<sup>st</sup> week of November, 2011, 2<sup>nd</sup> week of November, 2011 and 3<sup>rd</sup> week of November, 2011 whereas, it again appeared during 4<sup>th</sup> week of November, 2011 (0.33 red cotton bug/5min/m<sup>2</sup>) with no population during last week of November, 2011.

Earlier reports support the observation by Thapa (2006) who reported the red cotton bug as a flower visitor on radish blooms.

**Rice bug (*Leptocoris acuta*) :**

The first appearance of rice bug was recorded during 4<sup>th</sup> week of October, 2011 (0.33 rice bug/5 min/m<sup>2</sup>) with similar population trend during 1<sup>st</sup> week of November, 2011 (0.33 rice bug/5 min/m<sup>2</sup>). Further it disappeared during 2<sup>nd</sup> week of November, 2011 and it again appeared during 3<sup>rd</sup> week of November, 2011 (0.33 rice bug/5 min/m<sup>2</sup>). It disappeared during 4<sup>th</sup> week of November, 2011 and last week of November, 2011.

The present result corroborated the findings of Thapa (2006) who noticed rice earhead bug visiting on litchi flower.

**Tiger moth (*Amata passalis*) :**

The appearance of tiger moth was observed first time during 4<sup>th</sup> week of October, 2011 (0.50 tiger moth/5min/m<sup>2</sup>) and decreased during 1<sup>st</sup> week of November, 2011 (0.33 tiger moth/5min/m<sup>2</sup>) and same trend was recorded during 2<sup>nd</sup> week of November, 2011 (0.33 tiger moth/5min/m<sup>2</sup>). Thereafter, it disappeared during 3<sup>rd</sup> week of November, 2011, 4<sup>th</sup> week of November, 2011 and last week of November, 2011.

The present results are in the line with the findings of Dhurve (2008) who recorded the tiger moth as a visitor on niger flower.

**Blow fly (*Chrysomya bezziana*) :**

The blow fly appearance was first recorded during 4<sup>th</sup> week of October, 2011 (1.66 blow flies/5 min/m<sup>2</sup>) and same trend was recorded during 1<sup>st</sup> week of November, 2011 (1.16 blow flies/5 min/m<sup>2</sup>) with its peak population during 2<sup>nd</sup> week of November, 2011 (1.83 blow flies/5 min/m<sup>2</sup>) which decreased during 3<sup>rd</sup> week of November, 2011 (0.66 blow fly/5 min/m<sup>2</sup>), thereafter, its population was increased during 4<sup>th</sup> week of November, 2011 (1.66 blow flies/5 min/m<sup>2</sup>) and disappeared during last week of November, 2011. The average population was 0.80 blow fly/5 min/m<sup>2</sup>.

The present results on blow fly is in conformity with Priti *et al.* (2001) who reported the pollinators like *Apis florea*, *A. mellifera*, *A. dorsata*, *Halictus* sp., *Chrysomya bezziana*, *Gasterophilus* sp. and *Sarcophaga* sp. on radish flower. Sajjad *et al.* (2008) who also reported various pollinators on onion blooms, among them the dipterans species composed 72 per cent of syrphid flies and 28 per cent non-syrphid flies *i.e.* *Musca domestica*, *Calliphoridae* sp. and *Sarcophaga* sp.

#### Lady bird beetle (*Coccinella septumpunctata*) :

The first appearance of lady bird beetle was recorded during 1<sup>st</sup> week of November, 2011 (0.50 lady bird beetle/5 min/m<sup>2</sup>), similar population was also observed during 2<sup>nd</sup> week of November, 2011 (0.50 lady bird beetle/5 min/m<sup>2</sup>) with disappearance of population during 3<sup>rd</sup> week of November, 2011 two peak population was recorded during 4<sup>th</sup> week of November, 2011 (0.66 lady bird beetle/5 min/m<sup>2</sup>).

The findings are in close agreements with the Thapa (2006) who reported the lady beetle as flower visitor on brinjal, broccoli, buckwheat, cucumber, litchi, radish, rapeseed and squash. Brar *et al.* (2009) also reported *Coccinella* sp. visiting on radish flower.

#### Wasp (*Vespa cincta*) :

The first appearance of wasp was recorded during 1<sup>st</sup> week of November (0.33 wasp/5 min/m<sup>2</sup>) and similar population was recorded during 2<sup>nd</sup> week of November (0.33 wasp/5 min/m<sup>2</sup>) with its peak population during 3<sup>rd</sup> week of November, 2011 (0.50 wasp/5 min/m<sup>2</sup>) and same population was also noticed during 4<sup>th</sup> week of November, 2011 (0.50 wasp/5 min/m<sup>2</sup>) and decreased during last week of November (0.33 wasp/5 min/m<sup>2</sup>). The average population was 0.24 wasp/5 min/m<sup>2</sup>.

The present findings are more or less conformity with the earlier reports of Dhurve (2008) who observed the wasp on niger flowers. Jadhav *et al.* (2010) recorded the *Vespa tropica* and *Polistine* sp. were visiting on hybrid sunflower.

#### Tachinid fly (*Sarcophaga* sp.) :

The first appearance of tachinid fly was found during 2<sup>nd</sup> week of November (0.50 tachinid fly/5 min/m<sup>2</sup>) with similar trend was found during 3<sup>rd</sup> week of November, 2011. Further, it decreased during 4<sup>th</sup> week of November, 2011 (0.33 tachinid fly/5 min/m<sup>2</sup>) and similar trend was observed during last week of November (0.33 tachinid fly/5 min/m<sup>2</sup>). The mean population was 0.20 tachinidfly/5 min/m<sup>2</sup>.

The present results are in close conformity with the findings of Saeed *et al.* (2012) who reported the *sarcophaga* sp. as a pollinator visiting on bitter gourd.

The above observations with regard to the succession of visitors/ pollinators indicate that the population of visitors were very meager and the order of appearance of the visitors were *Apis cerana indica*, *Apis florea*, *Danus chrysippus*,

*Eristalis* sp., *Pelopidas mathias*, *Apis dorsata*, *Musca domestica*, *Nazara virudula*, *Dysdercus cingulatus*, *Leptocoris acuta*, *Amata passelis*, *Chrysomya bezziana*, *Coccinella septumpunctata*, *Vespa cincta* and *Sarcophaga* sp.

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