



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(7): 622-627
© 2023 TPI

www.thepharmajournal.com

Received: 14-04-2023

Accepted: 18-05-2023

Dwarka

Ph.D. Research Scholar,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Dr. AK Saxena

Assistant Professor/Scientist,
PC Unit (ICAR) Sesame and
Niger, College of Agriculture,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Dr. Anand Kumar Panday

Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Dr. Surabhi Jain

Assistant Professor/Scientist,
PC Unit (ICAR) Sesame and
Niger, College of Agriculture,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Dr. RS Marabi

Assistant Professor/Scientist,
PC Unit (ICAR) Sesame and
Niger, College of Agriculture,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Corresponding Author:

Dwarka

Ph.D. Research Scholar,
Jawaharlal Nehru Krishi Vishwa
Vidyalaya, Jabalpur, Madhya
Pradesh, India

Succession of different insect pollinators on Niger flowers grown under different dates of sowing

Dwarka, Dr. AK Saxena, Dr. Anand Kumar Panday, Dr. Surabhi Jain and Dr. RS Marabi

Abstract

An experiment was conducted to record the succession of pollinators/visitors on Niger crops grown under different dates of sowing during *Kharif* 2021 and 2022. Among the pollinators visited on Niger flowers the giant honey bee, *Apis dorsata* was the most dominant pollinators, Hoverfly, *Eristalinus megacephalus* was the second most dominant pollinator species recorded on Niger flowers. Among the pollinators the highest occurrence of Indian honey bee, *Apis cerana indica*, European honey bee, *Apis mellifera*, violet carpenter bee, *Xylocopa Violaceaa* and hoverfly, *Eristalinus megacephalus* were observed from the 1st date of sowing, (15th July) however the highest visit of the giant honey bee, *Apis dorsata* and rice skipper, *Parnara guttatus* were recorded from the crop sown at 25th August. Among the recorded pollinators, the longest succession period (43 days) under all the dates sown crop was observed for *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (8 days) was observed for *Xylocopa Violaceaa* and *Zizina Otis*.

Keywords: Succession, pollinators, Niger flowers, dates of sowing

1. Introduction

Oilseed crops formed the backbone of India agricultural economy since time immemorial, The unique agro-ecological conditions of India are ideal for cultivating all nine annual oilseeds, including seven edible oilseeds (groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower and niger), as well as two non-edible oilseeds (castor and linseed). Among the edible oilseeds crop Niger [*Guizotia abyssinica* (L.F.) Cass.] Is a native of Tropical Africa and belongs to the family Asteraceae (Compositae) is the lifeline of tribal agriculture and economy in India and is grown by tribals on marginal and sub-marginal lands with negligible inputs under rainfed conditions (Ranganatha *et al.*, 2009) ^[9]. In India, Niger provides about 3% of the edible oil requirement of the country (Getinet and Sharma, 1996) ^[3]. In India, it is grown on an area of 180.8 million hectares with a production of 65.4 million tonnes and an average productivity of 361.8 kg per hectare. Madhya Pradesh supplies 4.2 lakh hectares of land, with an annual yield of 1.7 lakh tonnes and seed productivity of 400 kg per hectare (Anonymous, 2020-21) ^[1]. The biology of Niger flowers consists of two types of florets: Disc and ray florets. The latter are eight to fifteen in number and are bright yellow in colour, which turns golden as they age. Disc florets are organized in three whorls and have a number of less than 45 but occasionally more. Each capitulum has a flowering cycle of about 7 to 8 days. Early in the morning, florets open and release pollen, while the style emerges in the afternoon and the stigma lobes separate and curl backwards in the evening. Almost every insect order has been identified as being involved in the pollination of one or more crops. Ants, aphids, bees, beetles, butterflies, and moths, as well as flies, midges, mosquitoes, thrips, and wasps, pollinate cultivated crops (McGregor, 1976; Free, 1993) ^[2] and only honeybees are responsible for 70 to 80% of insect pollination (Johannsmeier and Mostert, 2001) ^[4]. Different pollinators, such as *Apis dorsata*, *Apis cerana*, *Apis florea*, *Trigona iridipennis*, solitary bees, flies, butterflies, and beetles, were observed as dominant pollinators. Honeybees are the most important pollinators of Niger (91.30% of total pollinators). The lack of pollinating insects has a negative impact on seed output (Rao and Suryanarayana, 1990) ^[10]. It also has been reported that bee pollination results in a 22 to 33% increase in Niger yield and that honeybees were the major pollinators (91.30%) (Panda *et al.*, 1988) ^[7]. Therefore in the present investigation, the succession of different insect pollinators on Niger flowers grown under different dates of sowing were studied.

2. Material and Methods

The experiment to study the succession of pollinators/visitors on Niger flowers grown under different sowing dates was conducted at the experimental farm of Project Coordinating Unit Sesame and Niger, College of Agriculture, JNKVV, Jabalpur during *Kharif*, 2021 and 2022 under unsprayed conditions. Observations started from the 5 per cent flowering stage and continued till the end of flowering. The observations were recorded at intervals of two hours from 7:00 am to 05:00 pm. The total population of different

pollinators who visited on Niger Flowers was recorded on five randomly selected spots of 1m² area for 5 minutes.

3. Result and Discussion

To study the succession of insect pollinators, the crop was kept free from insecticide application. Weekly observation of different insect pollinators was recorded on five randomly selected spots of 1m² area for 5 minutes starting from the five per cent flowering stage to the end of the flowering.

Table 1: Succession of pollinators on Niger crop at Jabalpur during *Kharif* season 2021 and 2022 (Pooled)

Pollinators	Dates of sowing					
	1 st	2 nd	3 rd	4 th	5 th	6 th
<i>Apis cerana indica</i>	√	√	√	√	√	√
<i>Apis mellifera</i>	√	√	√	√	√	√
<i>Apis dorsata</i>	√	√	√	√	√	√
<i>Apis florea</i>	√	√	√	√	√	√
<i>Xylocopa violacea</i>	√	√	√	√	x	x
<i>Amata cyssea</i>	√	√	√	√	√	√
<i>Eristalinus megacephalus</i>	√	√	√	√	√	√
<i>Parnara guttatus</i>	√	√	√	√	√	√
<i>Danaus genutia</i>	√	√	√	√	x	x
<i>Zizina otis</i>	√	√	√	√	√	x
<i>Musca domestica</i>	√	√	√	√	√	√

3.1. First date of sowing (15th July)

The succession of different species of pollinators recorded during the 1st date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on Niger flowers from 3 to 45 day of flowering period. The activity of *Amata cyssea* was recorded from 3 to 38 days of the flowering period while *Musca domestica* was recorded from 3 to 31 days of the flowering period. The occurrence of *Danaus genutia* was recorded from 3 to 17 days of the flowering period while the occurrence of *Xylocopa Violacea* and *Zizina Otis* were recorded only from 3 to 10 days of the flowering period.

Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (8 days) was observed for *Xylocopa Violacea a* and *Zizina Otis* followed by (15 days) *Danaus genutia*.

3.2. Second date of sowing (25th July)

The succession of different species of pollinators recorded during the 2nd date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on Niger flowers from 3 to 45 day of flowering period. The activity of *Amata cyssea* was recorded from 3 to 38 days of the flowering period while *Musca domestica* was recorded from 3 to 24 days of the flowering period and 38 days of the flowering period. The occurrence of *Danaus genutia* was recorded from 3 to 17 days of the flowering period while the occurrence of *Xylocopa Violacea* and *Zizina Otis* recorded were recorded only from 3 to 10 days of the flowering period. Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (8 days) was observed for *Xylocopa*

Violacea and *Zizina Otis* followed by (15 days) *Danaus genutia*.

3.3. Third date of sowing (5th August)

The succession of different species of pollinators recorded during the 3rd date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on niger flowers from 3 to 45 day of flowering period. The activity of *Amata cyssea* was recorded from 3 to 38 days of the flowering period while *Musca domestica* was recorded from 10 to 45 days of the flowering period. The occurrence of *Danaus genutia* was recorded from 10 to 17 days flowering period while the occurrence of *Xylocopa Violacea* and *Zizina Otis* was recorded only from 3 to 10 days of the flowering period.

Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (8 days) was observed for *Danaus genutia*, *Xylocopa Violacea* and *Zizina Otis*.

3.4. Fourth date of sowing (15th August)

The succession of different species of pollinators recorded during the 4th date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on Niger flowers from 3 to 45 days of flowering period. The activity of *Amata cyssea* was recorded from 17 to 45 days of the flowering period while *Musca domestica* was recorded from 17 to 45 days flowering period. The occurrence of *Danaus genutia* was recorded from 10 to 17 days flowering period while the occurrence of *Xylocopa Violacea* and *Zizina Otis* were recorded only for one day on the 10th day of flowering. Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest

succession period (1 day) was observed for *Xylocopa Violacea* and *Zizina Otis* followed by (8 days) in case of *Danaus genutia*.

3.5. Fifth date of sowing (25th August)

The succession of different species of pollinators recorded during the 5th date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on Niger flowers from 3 to 45 day of flowering period. The activity of *Amata cyssea* was recorded from 3 to 38 days of the flowering period while *Musca domestica* was recorded from 24 to 45 days of the flowering period.

Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (22 days) was observed for *Musca domestica*.

3.6. Six dates of sowing (5th September)

The succession of different species of pollinators recorded during the 6th date of sowing revealed that the *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were visited on Niger flowers from 3 to 45 day of flowering period. The activity of *Amata cyssea* was recorded from 17 to 38 days of the flowering period while *Musca domestica* was recorded only one day on the 45th day of flowering.

Among the recorded pollinators the longest succession period (43 days) was observed in the case of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (1 days) was observed for *Musca domestica*.

In all the dates of sowing (different dates sown crop) the occurrence of *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* were recorded on niger flowers from 3 to 45 days of flowering period while the occurrence of *Amata cyssea* was recorded from 3 to 38 days of the flowering period in 1st (15th July) 2nd (25th July), 3rd (5th August) and 5th (25th August) dates sown crop while in 4th (15th August) and 6th (5th

September) dates of sowing its activity recorded from only 17 to 45 and 17 to 38 days of flowering period, respectively. The occurrence of *Musca domestica* was noticed from 3 to 31 days, 3 to 24 days, 10 to 45 days, 17 to 45 days, 24 to 45 days and on the 45th day of flowering in 1st (15th July) 2nd (25th July), 3rd (5th August) 4th (15th August), 5th (25th August) and 6th (5th September) dates sown crop respectively. The occurrence of *Danaus genutia* was recorded from 3 to 17 days in the 1st and 2nd dates sown crop while it occurs only 10 to 17 days of the flowering period in the 3rd and 4th dates sown crop. The occurrence of *Xylocopa Violacea* and *Zizina otis* was recorded only from 3 to 10 days of the flowering period in the 1st, 2nd and 3rd dates of sown crop however they occurred only one day (10th day of flowering) in crops sown under the 4th date of sowing. Present findings are corroborated by the findings of Patnaik *et al.*, (2004) [8] they found that the peak foraging activity (5 to 8 bees/m²/5 min.) of *Apis cerana* was at 50% flowering of the crop (41 days after sowing). Present findings are also supported by the findings of Painkra *et al.*, (2015) [6] who recorded 15 species of insect pollinators visiting Niger flowers. Amongst the pollinators, *Apis cerana indica* appeared first followed by *Apis florea*, *Danaus chrysippus*, *Eristalis sp.*, *Pelopidas mathias*, *Apis dorsata*, *Musca domestica*, *Nezara viridula*, *Dysdercus cingulatus*, *Leptocorisa acuta*, *Amata passelis*, *Chrysomya bezziana*, *Coccinella septempunctata*, *Vespa cincta* and *sarcophagi sp.*

Among the recorded pollinators the longest succession period (43 days) in all the dates sown crop was observed for *Apis cerana indica*, *Apis mellifera*, *Apis florea*, *Apis dorsata*, *Eristalinus megacephalus* and *Parnara guttatus* while the lowest succession period (8 days) was observed for *Xylocopa Violacea* and *Zizina Otis* followed by (15 days) *Danaus genutia* In 1st and 2nd dates sown crop. Under 3rd date sown crop the lowest succession period (8 days) was observed for *Danaus genutia*, *Xylocopa Violacea* and *Zizina Otis*. Under the 4th date sown crop the occurrence of (1 day) *Xylocopa Violacea* and *Zizina Otis* were observed for only one days. In the 5th and 6th dates sown crop the succession period for *Musca domestica* was observed only 22 days and 1 days respectively. Present findings are supported by the findings of Painkra *et al.*, (2015) [6] who recorded 15 species of insect pollinators were visited on Niger flowers.

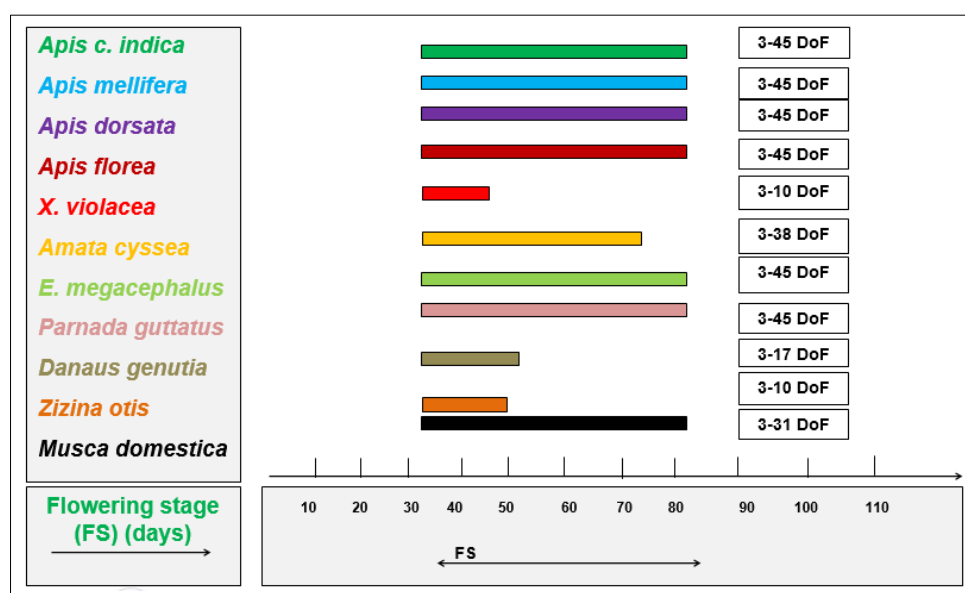


Fig 1: Succession of different pollinators on Niger crop, 1st sowing date (15 July)

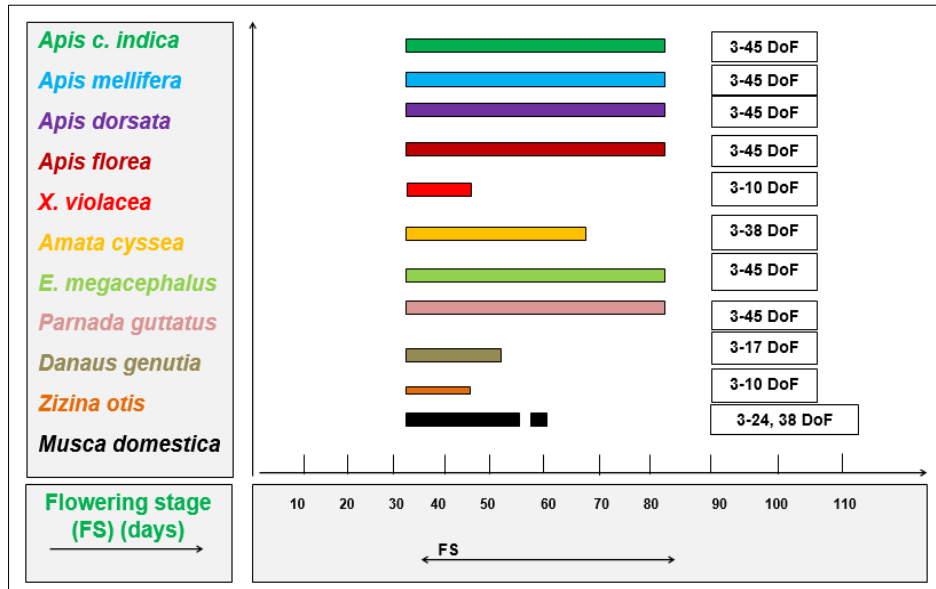


Fig 2: Succession of different pollinators Niger crop, 2nd sowing date (25 July)

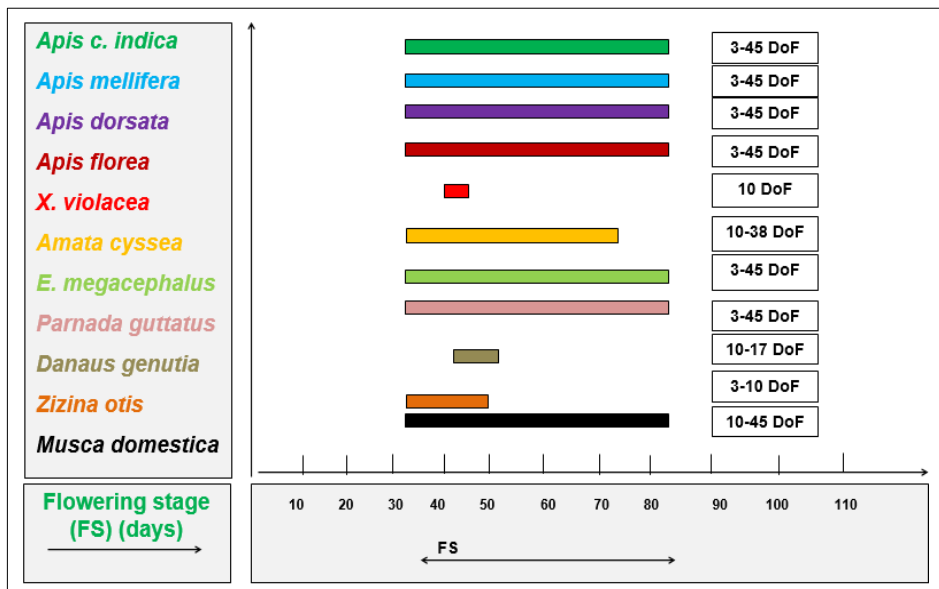


Fig 3: Succession of different pollinators on Niger crop, 3rd sowing date (5 August)

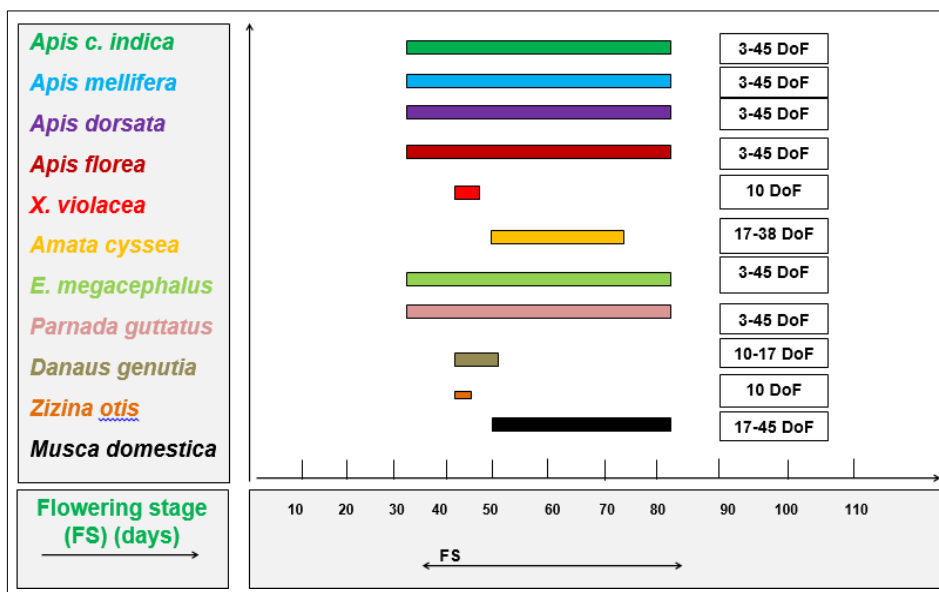


Fig 4: Succession of different pollinators Niger crop, 4th sowing date (15 August)

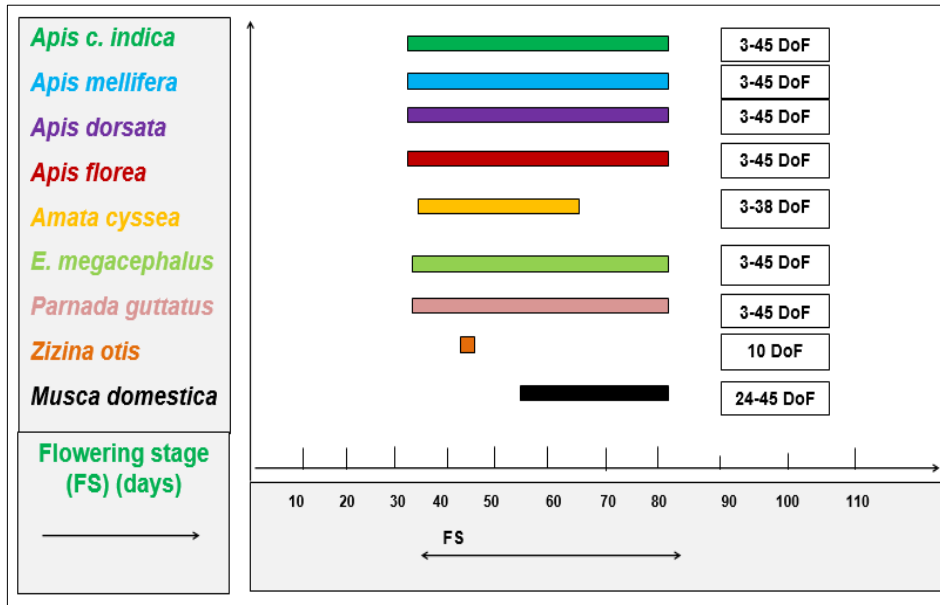


Fig 5: Succession of different pollinators Niger crop, 5th sowing date (25 August)

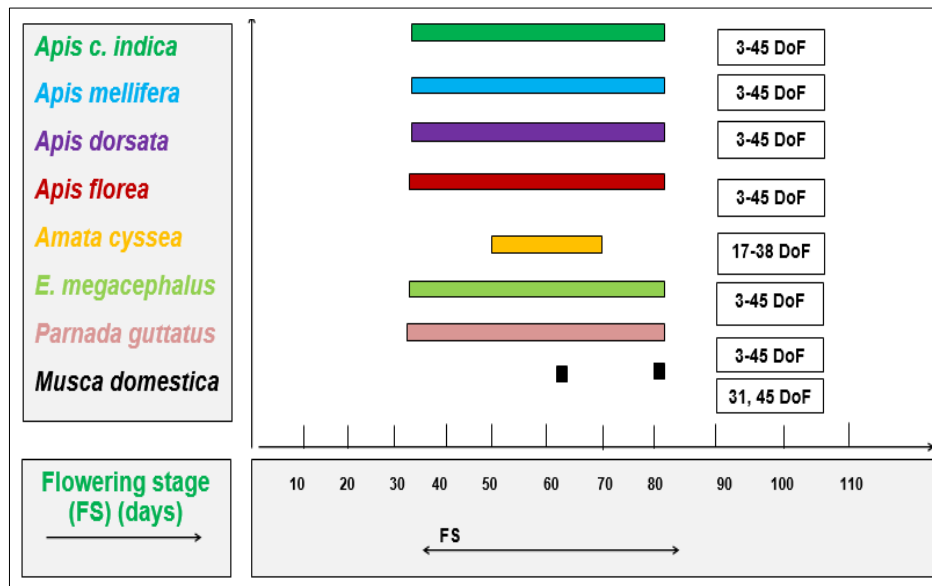


Fig 6: Succession of different pollinators Niger crop, 6th sowing date (5 September)

4. Conclusion

Among the pollinators visited on Niger flowers the giant honey bee, *Apis Dorsata* was the most dominant pollinator, Hoverfly, *Eristalinus megacephalus* was the second most dominant pollinator species recorded on Niger flowers. Among the pollinators the highest occurrence of Indian honey bee, *Apis cerana indica*, European honey bee, *Apis mellifera*, violet carpenter bee, *Xylocopa Violacea* and hoverfly, *Eristalinus megacephalus* were observed from the 1st date of sowing, (15th July) however the highest visit of the giant honey bee, *Apis Dorsata* and rice skipper, *Parnara guttatus* were recorded from the crop sown at 25th August.

5. References

1. Anonymous. 4th Advance Estimate, Agriculture Statistics Division, Directorate of Economics and Statistics, New Delhi. Indian Journal of Natural Products and Resources. 2020-21;2:221-226.
2. Free JB. Insect pollination of crops. London: Academic Press; c1993, p 684.

3. Getinet A, Sharma SM. Niger, *Guizotia Abyssinica* (L.F.) Cass. Promoting the conservation and use of underutilized and neglected crops. Institute of Plant Genetics and Crop Plant Research. International Plant Genetic Resources Institute, Rome; c1996. p. 1-60.
4. Johannsmeier MF, Mostert JN. Crop pollination. In: Johannsmeier MF. (Ed.), Beekeeping in South Africa, 3rd edition, revised, Plant Protection Research Institute Handbook 14. Agricultural Research Council of South Africa, Pretoria, South Africa; c2001. p. 235-245.
5. McGregor SE. Value of bee pollination to United States Department of Agriculture. American Bee Journal. 1976;124(3):184-186.
6. Painkra GP, Shrivastava SK, Shaw SS, Gupta R. Succession of various insect pollinators/visitors visiting on Niger crop (*G. Abyssinica* case.). Inter. J. of Plant Protection. 2015;8(1):93-98.
7. Panda P, Sontakke BK, Sarangi PK. Preliminary studies

- on the effect of honeybees (*Apis cerana indica* F.). Pollination on yield of *sesamum* and Niger. Indian Bee Journal. 1988;50(3):63-64.
8. Patnaik HP, Mohapatra LN, Das B. Effect of bee pollination on the yield of sesame under protected conditions. Indian Bee Journal. 2004;66(4):84-91.
 9. Ranganatha ARG, Tripathi A, Jyotishi A, Paroha S, Deshmukh MR, Shrivastava N. Strategies to enhance the productivity of sesame, linseed and Niger. In: Proceedings of Platinum Jubilee Celebrations, UAS, Raichur; c2009.
 10. Rao GM, Suryanarayana MC. Studies on the foraging behaviour of honeybees and its effect on the seed yield of Niger. Indian Bee Journal. 1990;52:31-33.