Association And Relative Abundance Of Honeybee And Other Insect Pollinators In Niger (Guizotia abyssinica Cass.) Under The Agro Climatic Conditions Of Ranchi, Jharkhand

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ABSTRACT
The insects visiting niger flowers were collected from open pollinated plot with the help of insect collection net (hand net) during the flowering of the crop which commenced in the last week of October, 2012 and continued up to first week of December, 2012. Of the different insect visitors, those which were seen working on niger flower heads, were considered to be the pollinators and were taken in to consideration for the study. The collection showed that a total of 13 insect species belonging to nine families under three orders viz., Hymenoptera, Lepidoptera and Diptera visited the niger flowers. Honeybees were observed to be the foremost pollinator fauna visiting the niger flowers under agro climatic conditions of Ranchi, Jharkhand. Among different honeybee species, A. mellifera constituted 41.38 per cent of the total pollinators recorded and surpassed rest of the pollinators, hence, it was considered to be the key pollinator. It was followed by A.c.indica (34.48%), Trigona sp. (6.9%) and A. dorsata (4.31%). The other pollinators collected, belonged to the orders Lepidoptera and Diptera and members of these two insect orders contributed 12.93 per cent of the total pollinators. Among non- hymenopteran pollinators, butterflies and moths belonging to the order Lepidoptera and families Danaidae, Nymphalidae, Pieridae, Hesperiidae and Lycaenidae formed the leading group. Among dipteran pollinators, Syrphids were found to be the dominant visitors of niger. Among different honey bee species, A.mellifera visited the crop in higher proportion (47.07 %) followed by A. cerana (40.50 %), Trigona sp. (7.99%) and A. dorsata (4.44%). Maximum bee visitation (7.45 bees/m²/minute) was recorded during 1000h to 1200h followed by 1400-1600h (6.15bees/m²/5minute), while the minimum (4.5 bees/m²/minute) was observed during 1600-1800h followed by 1200-1400h(4.85 bees/m²/minute) and 0800 to 1000h (5.2bees/m²/minute).

INTRODUCTION
Honeybee and some closely related social hymenoptera derive their food exclusively from flowers. While thus foraging on the floral products, these insects are instrumental in disseminating pollen and consequently accomplish the job of pollination par excellence .There effective use as a tool in increasing production is apparently in its infancy in our country.Pollen transfer depends upon the foraging mode of flower visitors which, in turn, would determine whether the visitor is a pollinator or non pollinator. However, different species may differ in their capacity to effectively pollinate a flower type in spite of their equal abundance (Kumar et al.,1994).Therefore, characterization of pollinators on the basis of their abundance, foraging modes and pollinating efficiency is an important component of crop pollination ecology and a pre-requisite for determining the pollination requirement of a crop (Williams,1977).Keeping this idea in view the present study was therefore planned in order to acquire more information on the insects visiting niger flower, and also to know the relative abundance of foraging honeybees.

MATERIALS AND METHODS
The studies were carried out at apiary of the Department of Agricultural Entomology, of Birsa Agricultural University, Kanke, Ranchi, Jharkhand from October to December 2012 (the blooming period of the crop). Various insect species, visiting niger flowers were collected by sweep method on target crop using cone hand net. Sweeping was done throughout the blooming of cultivar at an hourly interval from 0800 h to1700h. Insect collection was started three days after commencement of the flowering and continued up
to 90 per cent flowering. Collected insects were identified by comparing with reference insects from authentic sources. Abundance (number of bees/m²/minute) of different pollinators visiting niger flower- heads were recorded at different hours of the day starting from 0800h in the morning to 1800h in the evening at an interval of two hours. Observations were recorded at the open pollinated plots. For studying the relative abundance, population of insect pollinators was recorded by taking direct count on flower heads of the plants covering an area of one sq m in each replication. Five such places were selected randomly for taking insect counts.

RESULT AND DISCUSSION

Insect pollinators visiting niger flower

The collection showed that a total of 13 insect species belonging to nine families under three orders viz., Hymenoptera, Lepidoptera and Diptera visited the niger flowers. Honeybees were observed to be the foremost pollinator fauna visiting the niger flowers under agro-ecological condition of Kanke, Jharkhand. Among different honeybee species, A. mellifera constituted 41.38 per cent of the total pollinators recorded surpassing rest of the pollinators, hence, it was considered to be the key pollinator. It was followed by A.c.indica (34.48%), Trigona sp. (6.9%) and A. dorsata (4.31%). The other pollinators collected, belonged to the orders Lepidoptera and Diptera and members of these two insect orders contributed 12.93 per cent of the total pollinators. Among other pollinators, Lepidopterans formed the most dominant group which mainly included butterflies and moths of family Danaidae, Nymphalidae, Pieridae, Hesperidae and Lycaenidae. Among Dipteran pollinators, Syrphids were found to be the dominant visitors of niger. The present findings are in close agreement with (Mohanrao and Suryanarayana 1990) who reported honeybees as the main pollinators of niger. The present results also endorse the reports of Panda et al. (1995) who reported A.c.indica, A.dorsata and Trigona sp.as chief pollinating insects. Two more insect species i.e., Junania sp. and Euploea core were earlier reported to be pollinators in niger by Dhakal and Pandev(2003). The findings are also in close agreement with Viraktmash et al. (2001) who reported A.mellifera as a chief pollinator of niger. They also reported Dannaus chrysippus, Catopsilia pyranthae, Vespa sp. as other pollinators of niger. The present findings are in agreement with the report of Choudhary and Kumar (1998) and Kulkarni and Dhanorkar (1998) who reported Apoidea as the most pollinator group of niger.

![Fig.-1: Different species of insect pollinators visiting niger flower (%)](image)

### Table-1: Different species of insect pollinators visiting niger flower

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Scientific name</th>
<th>Common name</th>
<th>Order</th>
<th>Family</th>
<th>Insect count/100 sweep</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Apis cerana indica</td>
<td>Indian bee</td>
<td>Hymenoptera</td>
<td>Apidae</td>
<td>40</td>
<td>34.48</td>
</tr>
<tr>
<td>2.</td>
<td>Apis dorsata</td>
<td>Rock bee</td>
<td>Hymenoptera</td>
<td>Apidae</td>
<td>5</td>
<td>4.31</td>
</tr>
<tr>
<td>3.</td>
<td>Apis mellifera</td>
<td>European bee</td>
<td>Hymenoptera</td>
<td>Apidae</td>
<td>48</td>
<td>41.38</td>
</tr>
<tr>
<td>4.</td>
<td>Trigona sp.</td>
<td>Stingless bee</td>
<td>Hymenoptera</td>
<td>Melliponidae</td>
<td>8</td>
<td>6.90</td>
</tr>
<tr>
<td>5.</td>
<td>Vespa sp.</td>
<td>Wasp</td>
<td>Hymenoptera</td>
<td>Vaspidae</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Dannaus chrysippus</td>
<td>Monarch butterfly</td>
<td>Lepidoptera</td>
<td>Danaidae</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Junania sp.</td>
<td>Peacock pancy</td>
<td>Lepidoptera</td>
<td>Nymphalidae</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Relative abundance of bees
Among different honey bee species, *Apis mellifera* visited the crop in higher frequencies (47.07 %) followed by *A.cerana* (40.50 %), *Trigona sp.* (7.99 %) and *A.dorsata* (4.44 %). Maximum bee visitation (7.45 bees/m²/minute) was recorded during 1000h to 1200h followed by 1400-1600h.
The present findings are in line with Panda et al. (2015) who recorded highest intensity of A. mellifera at 1000-1200h (3.7-3.8 bees/m²/min) on B. rapa var. tertia. Arya et al. (1994) observed that insect pollination were more active between 0800 to 1100h with higher increase in evening hours. The above findings, however, do not find support from the results of Deshraj and Rana (1993) and Chakravarty (2000) who reported that the activity of bees was significantly high at 12.00h. The results are, however, in conformity with Singh et al. (2005) who recorded highest intensity of A. mellifera at 1000-1200h.

### Table 2: Relative abundance of honeybees/ pollinators on niger flowers at different day hours

<table>
<thead>
<tr>
<th>Pollinators</th>
<th>08:00-10:00h</th>
<th>10:00-12:00h</th>
<th>12:00-14:00h</th>
<th>14:00-16:00h</th>
<th>Mean</th>
<th>Relative abundance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. mellifera</td>
<td>9.40±0.15</td>
<td>14.60±0.39</td>
<td>9.80±0.20</td>
<td>10.40±0.30</td>
<td>8.80±0.05</td>
<td>10.60±0.32</td>
</tr>
<tr>
<td>A. cerana</td>
<td>9.00±0.08</td>
<td>12.20±0.56</td>
<td>7.20±0.77</td>
<td>9.80±0.20</td>
<td>7.40±0.18</td>
<td>9.12±0.04</td>
</tr>
<tr>
<td>A. dorsata</td>
<td>0.60±1.05</td>
<td>0.80±1.14</td>
<td>1.40±1.38</td>
<td>1.80±1.52</td>
<td>0.40±0.95</td>
<td>1.00±1.21</td>
</tr>
<tr>
<td>Trigona sp.</td>
<td>1.80±1.52</td>
<td>2.20±1.64</td>
<td>1.0±1.22</td>
<td>2.60±1.76</td>
<td>1.40±1.38</td>
<td>1.80±1.50</td>
</tr>
<tr>
<td>Mean</td>
<td>5.20±2.18</td>
<td>7.45±2.52</td>
<td>4.85±2.13</td>
<td>6.15±2.43</td>
<td>4.50±2.05</td>
<td></td>
</tr>
</tbody>
</table>

- Each value represents mean of 5 observations at each sampling time.
- Figures in the parentheses are √(x+ 0.5) transformed values.

### Figs 3 and 4: Relative abundance of honeybees at different hours of the day and (honeybees (%))
CONCLUSION
It can be concluded that honeybees were observed to be the main pollinator fauna of niger constituting 87 per cent of total pollinators under agro-ecological condition of Kanke, Jharkhand.

REFERENCES

CITATION OF THIS ARTICLE