**Effects of different dates of sowing on the incidence of borer complex in okra**

**ABSTRACT**

A field experiment was carried out on okra (*Abelmoschus esculentus* L. Moench) cv. Gujarat Anand Okra-8 during kharif 2024 at the Centre of Vegetable Research, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, by adopting all standard horticultural practices. The objective was to evaluate the impact of different sowing dates on the infestation levels of the borer complex and to determine the most suitable sowing time. Among the five sowing dates tested, crops sown on 8th and 15th July recorded lower borer complex infestation, whereas higher incidences were observed in the crops sown on 29th July and 5th August. The highest fruit yield (92.32 q/ha) was obtained from the 8th July sowing, which was at par with the 15th July sowing (82.11 q/ha). The lowest yield (71.43 q/ha) corresponded with the highest pest infestation on 5th August sowing, indicating that early to mid-July is the most suitable sowing window for minimizing pest incidence and maximizing yield.

*Keywords: Borer complex; fruit yield; okra; sowing time.*

**1. INTRODUCTION**

Agriculture is the backbone of the economy, providing food security, raw materials, and livelihoods to a significant portion of the global population (Dodiya and Barad, 2022). Vegetables play a crucial role in human nutrition, offering important elements like vitamins, energy-giving carbohydrates and minerals. They play a crucial role in maintaining nutritional balance, particularly in developing nations like India, where malnutrition remains a significant health issue among both children and adults. One such vegetable, okra (commonly known as lady’s finger or bhindi), botanically identified as *Abelmoschus esculentus* (L.) Moench, is widely grown across India, primarily for its tender fruit. These fruits are valued not only for their nutritional benefits but also for their dietary importance. While okra is most commonly consumed as a fresh vegetable, it is also utilized in processed forms such as canned, dried or frozen products (Dodiya *et al.,* 2024). Okra is a valuable crop primarily grown for its tender green fruits, though other parts of the plant such as its leaves, flower petals, stems and roots are also utilized for various purposes including food, biofuel and medicinal uses around the world. (Chincholkar *et al.,* 2023). Immature fruit are often pickled, when the fruit mature, their black, brown, or white-eyed seeds can be roasted and consumed as a coffee substitute (Dodiya *et al.,* 2023). Furthermore, the mucilage from okra has notable applications in both medicinal and industrial fields. (Akinyele and Temikotan, 2007). It is also rich in vitamins and antioxidants, including 185.00 μg of β-carotene, 0.08 mg of riboflavin, 0.04 mg of thiamin, 0.60 mg of niacin and 47.00 mg of vitamin C (Swamy *et al.,* 2023).

One of the major constraints for the low productivity of okra is its high vulnerability to attack by pests. Intensity of damage caused by pests also varies from season to season. Now a days, shoot and fruit borer are becoming serious and attaining economic importance. Shoot and fruit borer is a major pest of okra (Patil *et al.,* 2023). Mainly two species of shoot and fruit borer *viz*., *E. vittella* and *E. insulana* are found to cause serious damage to the crop however, *E. vittella* is the predominant species in Gujarat. The fruit borer complex result in both quantitative and qualitative loss to the crop. The insect caused fruit infestation of 40.12 - 52.43% in various parts of the country (Meena *et al.,* 2019; Rathore *et al.,* 2021; Nandaniyan *et al.,* 2022). Inflict the most destructive impact, boring into the terminal shoot during initial stage of crop while subsequently damaging the buds, flower and fruits (Sheoran *et al.,* 2023). According to an estimate this pest can cause 36-90 per cent loss in fruit yield of okra (Misra *et al.,* 2002) and 40 to 100 per cent to fruits of okra crop (Shinde *et al.,* 2007). Shoot and fruit borer alone causes a damage of between 52.33 and 70.75 per cent. (Choudhury *et al.,* 2021).

Studying different dates of sowing is important for managing *E. vittella* and *H. armigera* in okra because the timing of planting significantly influences the crop’s exposure to pest populations. These pests exhibit seasonal fluctuations and their infestation levels vary depending on climatic conditions and crop growth stages. By adjusting sowing dates, farmers can avoid periods of peak pest activity, thereby reducing crop damage. This cultural practice helps minimize the need for chemical control measures, supports integrated pest management (IPM), and promotes healthier crop development and better yields with reduced input costs and environmental impact.

**2. MATERIALS AND METHODS**

**2.1 Experimental site**

A field experiment was carried out on okra (cv. Gujarat Anand okra 8) by adopting all standard horticulture practices at Centre of Vegetable Research, C. P. College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat (24.3205° N, 72.3129° E) during *kharif* 2024.

**2.2 Experimental Details**

An experiment was laid out in a simple randomized block design with five (treatments) different dates of sowing *viz.,* 8th, 15th, 22nd, 29th of July and 5th August each date replicated four times. The seeds of okra (variety Gujarat Anand Okra 8) were sown in the plots measuring 3 x 3 m2 at seven days intervals, starting from 8th July to 5th August, during *kharif*, 2024 and raised by adopting recommended horticultural practices except insecticides measures.

**2.3 Observations Recorded**

The observations on pest populations were recorded by counting number of larva(e) per plant from ten randomly select plants from each treatment. Total number of fruits, healthy fruits and infested fruits were recorded from ten randomly selected plants of each treatment. The per cent infestation was worked out on the basis of healthy and infested fruits on number basis. The data was converted into per cent infested fruit and analyzed statistically by using of command prompt. The yield of healthy and damaged fruits was recorded from net plot area of each treatment at different pickings.

**3. RESULTS AND DISCUSSION**

**3.1 *E. vittella***

**3.1.1. Larve/plant**

A comprehensive evaluation of *E. vittella* larval infestation in okra across different sowing dates revealed distinct patterns of pest incidence from the 3rd to 12th week after germination (WAG). During the 3rd and 4th WAG, no larvae were detected in crops sown on 8th July, while low infestation levels began appearing in later sowings, with larval populations ranging from 0.43 to 0.83 larva per plant. By the 5th WAG, larval presence was observed across all sowing dates, with the earliest sowing (8th July) showing the least infestation (0.90 larva/plant) and 5th August sowing recording the highest (1.58 larvae/plant). This trend continued in the 6th and 7th WAG, where infestation steadily increased, peaking at 2.05 and 2.50 larvae per plant in the 5th August sowing, while the 8th July sowing maintained the lowest larval counts (1.13 and 1.26 larvae/plant, respectively). Similar patterns were observed through the 8th and 9th WAGs, with the 5th August sowing consistently exhibiting the most severe infestation levels 2.95 and 3.58 larvae per plant respectively, compared to the early sowings, which had significantly fewer larvae (1.58 and 1.53 larvae/plant for 8th July). The 10th WAG marked the season's infestation peak, where the 5th August sowing reached 3.70 larvae per plant, while the 8th July sowing remained lowest at 1.55 larvae per plant. This decreasing trend continued into the 11th and 12th WAGs, yet the same ranking of infestation persisted, with the 5th August sowing maintaining the highest larval count (3.65 and 3.58 larvae/plant) and the 8th July sowing exhibiting the lowest (1.35 and 1.28 larvae/plant). The pooled analysis across all weeks confirmed that the earliest sowings (8th and 15th July) had the least average infestation, with 0.97 and 1.44 larvae per plant respectively, statistically outperforming later sowings. In contrast, delayed sowing dates showed progressively higher pest pressure, peaking in the 5th August crop (2.34 larvae/plant), followed closely by 29th July (2.13 larvae/plant), and moderate infestation in the 22nd July sowing (1.93 larvae/plant), indicating that early sowing effectively mitigates *E. vittella* damage in okra

**3.1.2. Fruit damage**

A consolidated assessment of *E. vittella* fruit infestation in okra across varying sowing dates demonstrated that early sowing significantly minimized fruit damage throughout the growth period. During the 3rd and 4th weeks after germination (WAG), no fruit infestation was found in crops sown on 8th July, while minor damage began appearing in later sowings, ranging from 4.97 to 12.12 per cent. From the 5th WAG onward, all sowing dates exhibited fruit damage, with early-sown crops (8th July) consistently showing the lowest infestation (6.66% to 15.42%), while late-sown crops particularly 5th August exhibited the highest damage, progressively increasing from 16.05 per cent in the 5th WAG to a peak of 38.57 per cent in the 10th WAG. Intermediate sowing dates (15th, 22nd and 29th July) showed moderate levels of infestation throughout, with fruit damage gradually rising week by week; for example, crops sown on 29th July recorded 6.09 per cent in the 3rd WAG and escalated to 33.84 per cent by the 10th WAG. Even in the later weeks (11th and 12th WAG), the trend remained unchanged, with early sowing (8th July) maintaining the least infestation (14.76% and 14.25%), while the 5th August sowing showed the highest (37.88% and 36.80%). Pooled data analysis further validated these findings, confirming that crops sown on 8th and 15th July experienced the lowest overall fruit infestation at 9.12 and 16.28 per cent, respectively. In contrast, sowing on 22nd July (20.36%) and 29th July (22.34%) resulted in moderate damage, while the 5th August sowing recorded the highest average fruit infestation at 25.26 per cent, emphasizing the substantial benefits of early sowing in reducing fruity loss caused by *E. vittella* in okra.

The present investigation clearly demonstrated that delayed sowing significantly increased the infestation of the borer complex in okra, while early to mid-July sowings (8th and 15th July) resulted in reduced pest incidence and higher yields. These findings are consistent with earlier reports by Devi et al. (2017), who observed higher spotted bollworm incidence in late-sown cotton crops, and lower levels in early and normal sowing windows. Similarly, studies by Gautam et al. (2013), Sultane et al. (2017), and Jalgaonkar et al. (2020) also reported that early sowing minimized shoot and fruit borer damage, whereas delayed sowing intensified pest pressure. Bairwa et al. (2005) further supported this trend, noting increased pest damage and reduced yield in late sowings. However, while most previous studies have focused on cotton or brinjal, the present study specifically targets okra (*Abelmoschus esculentus*) under the agro-climatic conditions of North Gujarat, which has remained underexplored. By establishing a clear relationship between sowing time, pest incidence, and yield in okra, this study not only confirms known trends in a new crop and region but also provides precise numeric thresholds and sowing windows that can guide region-specific IPM strategies. Thus, it bridges a critical gap in localized pest management recommendations for okra growers in Gujarat.

**3.2. *H. armigera***

**3.2.1. Larva(e)/plant**

A comprehensive assessment of *H. armigera* infestation on okra across different sowing dates revealed a clear trend: early sowing significantly reduced larval populations, while delayed sowing resulted in higher infestations. During the third week after germination (WAG), no larvae were detected in crops sown on 8th and 15th July, whereas crops sown later showed increasing larval numbers. From the 4th to the 12th WAG, the infestation gradually intensified across all treatments, with the earliest sown crops (8th July) consistently exhibiting the lowest larval densities. In contrast, crops sown on 5th August recorded the highest larval populations throughout the observation period, peaking at 2.60 larvae per plant in the 10th WAG. Moderate infestations were observed in crops sown on 15th, 22nd and 29th July. The pooled data reinforced these findings, showing that the lowest overall larval presence occurred in the 8th July (0.56 larva/plant) and 15th July (1.06 larvae/plant) sowings, both of which were significantly better than the later sowings. The 5th August sowing had the highest average infestation (1.68 larvae/plant), followed by 29th July (1.54 larvae/plant), while the 22nd July sowing (1.42 larvae/plant) remained statistically at par with the latter two. Overall, early sowing was highly effective in minimizing *H. armigera* infestation in okra.

**3.2.2. Fruit damage**

A detailed analysis of fruit damage caused by *H. armigera* in okra across different sowing dates showed a significant influence of planting time on infestation levels. No fruit damage was recorded during the 3rd WAG in crops sown on 8th and 15th July, while crops sown on 22nd, 29th July and 5th August experienced increasing levels of fruit infestation (3.45%, 4.53% and 5.10%, respectively). From the 4th to 12th week after germination, fruit infestation progressively increased across all treatments, with the lowest values consistently recorded in the earliest sowing (8th July). Peak infestation occurred during the 10th WAG, where the 5th August sowing recorded the highest damage at 21.07 per cent, followed by 29th July (19.63%), 22nd July (18.74%), 15th July (16.25%) and the least in 8th July (15.44%). This pattern persisted across other weeks, with the 5th August sowing regularly showing the highest infestation (up to 20.68% and 18.85% in the 11th and 12th WAG, respectively), whereas early sown crops maintained significantly lower fruit damage. The pooled data affirmed these trends, revealing that crops planted on 8th and 15th July had the lowest average fruit infestation at 7.99 and 9.86 per cent, respectively, both statistically superior to later sowing dates. The highest cumulative infestation was recorded in the 5th August sowing (14.73%), followed by 29th July (12.22%) and 22nd July (11.08%), emphasizing that delayed sowing substantially increased susceptibility to *H. armigera* fruit damage in okra.

Bairwa *et al.* (2005) and Kalyan and Ameta (2017) reported that infestation and fruit damage by *H. armigera* increased with delay in sowing and the highest yield was obtained under the earliest sowing. Thus, the present findings are more or less proximity to previous findings.

**3.3. Fruit yield**

The data presented in Table 1 and illustrated in Figure 1 revealed that the highest fruit yield of okra (92.32 q/ha) was obtained from the crop sown on 8th July, which was significantly superior, followed by the crop sown on 15th July (82.11 q/ha), with both treatments showing statistically similar performance. The crop planted on 22nd July produced a moderate yield of 76.61 q/ha. In contrast, delayed sowing resulted in reduced yields, with the lowest recorded from the crop sown on 5th August (71.43 q/ha), followed closely by the 29th July sowing (72.32 q/ha). These results align with earlier studies by Kaur *et al.* (2013) and Jalgaonkar *et al.* (2024), who observed that okra sown on 10th February yielded more marketable fruits compared to sowings on 26th January and 25th February, indicating that the present outcomes are generally consistent with previous research.

**4. CONCLUSION**

Early sowing of okra, particularly on 8th and 15th July (second and third week of July) resulted in significantly lower incidence of borer complex and higher fruit yields. In contrast, delayed sowing on 29th July (fifth week of July) and 5th August (first week of August) led to increased pest infestation and reduced yields. Therefore, timely sowing, especially around early July, is crucial for minimizing pest damage and maximizing okra productivity.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The author(s) affirm that no artificial intelligence tools, including large language models (such as ChatGPT, Copilot, etc.) or image generation technologies, were utilized in any part of the drafting, composing or revising of this manuscript.

**REFERENCES**

1. Akinyele, B. O., & Temikotan, T. (2007). Effect of variation in soil texture on the vegetative and pod characteristics of okra (*Abelmoschus esculentus* (L.) Moench). *International Journal of Agricultural Research*, 2(2), 165-169.
2. Bairwa, D. K., et al. (2005). Effect of dates of sowing on the incidence of jassids, whiteflies and shoot and fruit borer of okra. *Annals of Agricultural Research*, 26(3), 458-459.
3. Chincholkar, A. S., et al. (2023). Comparative field efficacy of biorationals and chemical insecticides against shoot and fruit borer, *Earias* spp. in okra. *The Pharma Innovation Journal*, 12(5), 2747-2750.
4. Choudhury, M. A. R., et al. (2021). Evaluation of biological approaches for controlling shoot and fruit borer (*Earias vittella* F.) of okra grown in peri-urban area in Bangladesh. *Horticulturae*, 7(1), 7.
5. Devi S., et al. (2017). Chapter-7 Effect of Dates of Sowing on Spotted Bollworm (*Earias vittella* Fabricius) and Pink Bollworm (*Pectinophora gossypiella* Saunders) in desi cotton, pp. 109-115.
6. Dodiya, R. D., & Barad, A. H. (2022). Effectiveness of biopesticides against *Spodoptera litura* infesting groundnut under field condition. *The Pharma Innovation Journal*, 11(8), 1601.
7. Dodiya, R. D., et al. (2023). Host Suitability of Tobacco Leaf Eating Caterpillar (*Spodoptera litura* F.) under Laboratory Condition. *International Journal of Bio-resource and Stress Management*, 14(Aug, 8), 1186-1195.
8. Dodiya, R. D., et al. (2024). Efficacy of Insecticides against *Spodoptera Litura* (Fabricius) Infesting Groundnut (*Arachis Hypogaea* Linnaeus). *Pesticide Research Journal*, 36(2), 125-129.
9. Gautam, H. K., et al. (2013). Morphological and biochemical characters in fruit against okra shoot and fruit borer (*Earias vittella* F.). *Indian Journal of Entomology*, 75(3), 189-193.
10. Jalgaonkar, Vinayak, N., et al. (2020). Effect of sowing date with relation to incidence of shoot and fruit borer on okra. *Journal of Entomology and Zoology Studies*, 8(3), 1872-1875.
11. Kalyan, R. K., & Ameta, O. P. (2017). Effect of sowing time and varieties on incidence of insect pests of soybean. *Journal of Entomology and Zoology Studies*, 5(2), 790-794.
12. Kaur, S., et al. (2013). Influence of sowing dates and varieties of okra on incidence of shoot and fruit borer, *Earias* spp. under field conditions in Punjab. *Insect Environment*, 19(3), 45-48.
13. Meena, A., et al. (2019). Population dynamics of major arthropod pests and their natural enemies on okra. *Indian Journal of Entomology*, 81(3), 570-574.
14. Misra, H. P., et al. (2002). Efficacy of some insecticides against okra fruit borer, *Earias* spp. and leaf roller, *Sylepta derogata* Fab. *Annals of Plant Protection Science*, 10(1), 51-54.
15. Nandaniyan, M. G., et al. (2022). Seasonal incidence and management of okra shoot and fruit borer, *Earias vittella* (Fabricius). *The Pharma Innovation Journal*, 11(11), 2339-2346.
16. Patil, R., et al. (2023). Evaluation of IPM against pest complex of okra. *Indian Journal of Entomology*, 86(2), 547-550. DOI: https://doi.org/10.55446/IJE.2023.822.
17. Rathore, B. S., et al. (2021). Effect of abiotic factors on seasonal incidence of shoot and fruit borer [*Earias vittella* (Fabricius)] on okra. *International Journal of Plant and Environment*, 7(3), 240-242.
18. Sheoran, S., et al. (2023). A comparative study of biology and morphometrics of two different species of *Earias* on okra crop. *International Journal of Tropical Insect Science,* 43(5), 1723-1732.
19. Shinde, B. D., et al. (2007). Bio efficacy of botanical microbial and synthetic insecticides against okra fruit borer. *Pestology*, 31(3), 19-22.
20. Sultane, D. A., et al. (2017). Effect of different sowing dates of okra on occurrence of okra shoot and fruit borer, *E. vittella* Fabricius. *International Journal of Farm Sciences*, 7(3), 129-131.
21. Swamy, K. R. M. (2023). Origin, distribution, taxonomy, botanical description, cytogenetics, genetic diversity and breeding of okra (*Abelmoschus esculentus* (L.) Moench.). *International Journal of Development Research*, 13(3), 62026-62046.

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| **Table 1. Effect of different dates of sowing against okra shoot and fruit borer, *E. vittella* during *kharif* 2024** | | | | | | | | | | | | | |
| **Sr. No.** | **Treatments** | | **No. of larvae/ plant** | | | | | | | | | | |
| **Weeks after germination (WAG)** | | | | | | | | | | |
| **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Pooled over periods** |
| D1 | 8th July | | 0.71  (0.00) | 0.71  (0.00) | 1.18  (0.90) | 1.26  (1.13) | 1.35  (1.26) | 1.43  (1.58) | 1.41  (1.53) | 1.42  (1.55) | 1.36  (1.35) | 1.31  (1.28) | 1.21a  (0.97) |
| D2 | 15th July | | 0.71  (0.00) | 1.18  (0.90) | 1.31  (1.23) | 1.42  (1.55) | 1.47  (1.73) | 1.64  (2.25) | 1.62  (2.15) | 1.59  (2.05) | 1.51  (1.80) | 1.47  (1.70) | 1.39b  (1.44) |
| D3 | 22nd July | | 0.96  (0.43) | 1.17  (0.88) | 1.32  (1.25) | 1.51  (1.80) | 1.66  (2.25) | 1.72  (2.48) | 1.75  (2.58) | 1.84  (2.90) | 1.81  (2.85) | 1.83  (2.85) | 1.56c  (1.93) |
| D4 | 29th July | | 1.04  (0.60) | 1.13  (0.78) | 1.38  (1.40) | 1.54  (1.88) | 1.67  (2.30) | 1.77  (2.63) | 1.89  (3.10) | 1.94  (3.28) | 1.93  (3.23) | 1.90  (3.13) | 1.62cd  (2.13) |
| D5 | 5th August | | 1.02  (0.55) | 1.15  (0.83) | 1.44  (1.58) | 1.60  (2.05) | 1.73  (2.50) | 1.85  (2.95) | 2.01  (3.58) | 2.05  (3.70) | 2.04  (3.65) | 2.02  (3.58) | 1.69d  (2.34) |
| S. Em. | | T | 0.04 | 0.05 | 0.05 | 0.06 | 0.07 | 0.07 | 0.07 | 0.07 | 0.08 | 0.07 | 0.02 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.03 |
|  | | T× P | - | - | - | - | - | - | - | - | - | - | 0.07 |
| C. D. at 5% | | T | 0.12 | 0.14 | 0.16 | 0.19 | 0.21 | 0.21 | 0.22 | 0.22 | 0.26 | 0.22 | 0.08 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.08 |
|  | | T×P | - | - | - | - | - | - | - | - | - | - | 0.19 |
| C. V. % | | | 9.12 | 8.52 | 8.06 | 8.36 | 8.69 | 8.24 | 8.31 | 8.06 | 9.72 | 8.24 | 8.68 |
| Figures in parentheses are retransformed values and those outside are transformed values, Treatment means with the letter(s) in common are not significantly different by DNMRT at 5% level of significance | | | | | | | | | | | | | |

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| **Table 2. Effect of different dates of sowing against okra shoot and fruit borer, *E. vittella* during *kharif* 2024** | | | | | | | | | | | | | | |
| **Sr. No.** | **Treatments** | | **Fruit damage (%)** | | | | | | | | | | | |
| **Weeks after germination (WAG)** | | | | | | | | | | | |
| **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Pooled over periods** |
| D1 | 8th July | | 0.00  (0.00) | 0.00  (0.00) | 14.54  (6.66) | 19.20  (10.90) | 21.75  (13.74) | 21.96  (14.03) | 22.59  (14.90) | 23.01  (15.42) | 22.50  (14.76) | 22.11  (14.25) | 17.58a  (9.12) |
| D2 | 15th July | | 0.00  (0.00) | 15.62  (7.29) | 21.12  (12.99) | 23.91  (16.44) | 25.78  (18.93) | 27.97  (22.05) | 29.45  (24.22) | 30.46  (26.24) | 30.07  (25.17) | 29.25  (23.92) | 23.80b  (16.28) |
| D3 | 22nd July | | 12.86  (4.97) | 17.31  (8.86) | 21.70  (13.70) | 25.09  (18.27) | 28.83  (23.27) | 31.11  (26.77) | 32.29  (28.69) | 33.71  (30.82) | 32.76  (29.31) | 32.51  (28.91) | 26.82c  (20.36) |
| D4 | 29th July | | 14.23  (6.09) | 18.33  (9.90) | 22.72  (14.99) | 26.82  (20.36) | 29.78  (24.80) | 31.76  (27.72) | 33.47  (30.42) | 35.53  (33.84) | 35.18  (33.25) | 34.25  (31.75) | 28.21c  (22.34) |
| D5 | 5th August | | 16.33  (7.91) | 20.29  (12.12) | 23.57  (16.05) | 27.24  (20.98) | 30.71  (26.31) | 33.36  (30.45) | 36.51  (35.50) | 38.36  (38.57) | 37.97  (37.88) | 37.31  (36.80) | 30.17d  (25.26) |
| S. Em. | | T | 0.42 | 1.02 | 0.98 | 1.05 | 1.10 | 1.17 | 1.27 | 1.32 | 1.33 | 1.26 | 0.50 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.49 |
|  | | T× P | - | - | - | - | - | - | - | - | - | - | 1.09 |
| C. D. at 5% | | T | 1.29 | 3.15 | 3.02 | 3.23 | 3.39 | 3.60 | 3.92 | 4.06 | 4.08 | 3.90 | 1.43 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 1.46 |
|  | | T×P | - | - | - | - | - | - | - | - | - | - | 3.05 |
| C. V. % | | | 8.13 | 13.12 | 9.45 | 8.58 | 8.04 | 8.00 | 8.23 | 8.16 | 8.36 | 8.14 | 8.61 |
| Figures in parentheses are retransformed values and those outside are arcsine transformed values, Treatment means with the letter(s) in common are not significantly different by DNMRT at 5% level of significance | | | | | | | | | | | | | | |

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| **Table 3. Effect of different dates of sowing against okra fruit borer, *H. armigera* during *kharif* 2024** | | | | | | | | | | | | | |
| **Sr. No.** | **Treatments** | | **No. of larvae per plant** | | | | | | | | | | |
| **Weeks after germination (WAG)** | | | | | | | | | | |
| **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Pooled over periods** |
| D1 | 8th July | | 0.71  (0.00) | 0.71  (0.00) | 0.95  (0.43) | 1.04  (0.60) | 1.12  (0.75) | 1.16  (0.88) | 1.18  (0.93) | 1.22  (1.00) | 1.16  (0.85) | 1.03  (0.58) | 1.03a  (0.56) |
| D2 | 15th July | | 0.71  (0.00) | 1.11  (0.73) | 1.12  (0.78) | 1.26  (1.10) | 1.32  (1.25) | 1.36  (1.38) | 1.39  (1.45) | 1.44  (1.58) | 1.39  (1.45) | 1.37  (1.38) | 1.25b  (1.06) |
| D3 | 22nd July | | 0.88  (0.28) | 1.07  (0.65) | 1.23  (1.03) | 1.31  (1.23) | 1.39  (1.45) | 1.47  (1.73) | 1.58  (2.08) | 1.67  (2.28) | 1.64  (2.20) | 1.62  (2.13) | 1.39c  (1.42) |
| D4 | 29th July | | 0.95  (0.40) | 1.05  (0.63) | 1.17  (0.88) | 1.33  (1.28) | 1.41  (1.50) | 1.55  (1.93) | 1.66  (2.30) | 1.75  (2.58) | 1.72  (2.50) | 1.71  (2.45) | 1.43cd  (1.54) |
| D5 | 5th August | | 1.03  (0.60) | 1.18  (0.93) | 1.27  (1.13) | 1.33  (1.33) | 1.48  (1.73) | 1.58  (2.03) | 1.68  (2.35) | 1.76  (2.60) | 1.73  (2.53) | 1.73  (2.47) | 1.48d  (1.68) |
| S. Em. | | T | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.09 | 0.10 | 0.06 | 0.06 | 0.06 | 0.02 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.03 |
|  | | T× P | - | - | - | - | - | - | - | - | - | - | 0.07 |
| C. D. at 5% | | T | 0.16 | 0.20 | 0.20 | 0.20 | 0.17 | 0.28 | 0.30 | 0.20 | 0.20 | 0.19 | 0.06 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.09 |
|  | | T×P | - | - | - | - | - | - | - | - | - | - | 0.20 |
| C. V. % | | | 12.24 | 12.70 | 11.17 | 10.18 | 8.39 | 12.77 | 12.89 | 8.20 | 8.34 | 8.16 | 10.53 |
| Figures in parentheses are retransformed values and those outside are transformed values, Treatment means with the letter(s) in common are not significantly different by DNMRT at 5% level of significance | | | | | | | | | | | | | |

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| **Table.4. Effect of different dates of sowing against okra fruit borer, *H. armigera* during *kharif* 2024** | | | | | | | | | | | | | |
| **Sr. No.** | **Treatments** | | **Fruit damage (%)** | | | | | | | | | | |
| **Weeks after germination (WAG)** | | | | | | | | | | |
| **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **Pooled over periods** |
| D1 | 8th July | | 0.00  (0.00) | 0.00  (0.00) | 13.31  (5.36) | 15.81  (7.48) | 18.83  (10.49) | 20.77  (12.78) | 19.60  (13.88) | 23.09  (15.44) | 22.63  (14.87) | 22.09  (14.18) | 16.42a  (7.99) |
| D2 | 15th July | | 0.00  (0.00) | 12.02  (4.39) | 15.48  (7.18) | 17.75  (9.31) | 19.84  (11.59) | 21.45  (13.43) | 23.38  (15.79) | 23.72  (16.25) | 22.79  (15.03) | 22.06  (14.14) | 18.30b  (9.86) |
| D3 | 22nd July | | 10.69  (3.45) | 13.21  (5.24) | 15.55  (7.20) | 17.95  (9.54) | 20.02  (11.77) | 21.68  (13.68) | 23.77  (16.26) | 25.64  (18.74) | 23.94  (16.52) | 22.31  (14.45) | 19.45bc  (11.08) |
| D4 | 29th July | | 12.27  (4.53) | 14.28  (6.15) | 15.78  (7.40) | 18.17  (9.81) | 20.09  (11.86) | 22.49  (14.68) | 24.94  (17.87) | 26.21  (19.63) | 25.56  (18.87) | 25.00  (17.89) | 20.46c  (12.22) |
| D5 | 5th August | | 13.03  (5.10) | 17.13  (8.68) | 19.22  (10.88) | 21.14  (13.03) | 23.35  (15.82) | 25.13  (18.06) | 26.18  (19.50) | 27.90  (21.07) | 26.96  (20.68) | 25.65  (18.85) | 22.57d  (14.73) |
| S. Em. | | T | 0.33 | 0.52 | 0.67 | 0.76 | 0.84 | 0.85 | 1.15 | 1.04 | 0.98 | 0.95 | 0.48 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 0.38 |
|  | | T× P | - | - | - | - | - | - | - | - | - | - | 0.85 |
| C. D. at 5% | | T | 1.03 | 1.61 | 3.02 | 3.23 | 3.39 | 3.60 | 3.92 | 4.06 | 4.08 | 3.90 | 1.39 |
|  | | P | - | - | - | - | - | - | - | - | - | - | 1.06 |
|  | | T×P | - | - | - | - | - | - | - | - | - | - | 2.36 |
| C. V. % | | | 7.58 | 8.60 | 8.50 | 8.36 | 8.22 | 7.63 | 9.75 | 8.21 | 8.06 | 8.13 | 8.68 |
| Figures in parentheses are retransformed values and those outside are arcsine transformed values, Treatment means with the letter(s) in common are not significantly different by DNMRT at 5% level of significance | | | | | | | | | | | | | |

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| **Table 5: Impact of sowing periods on fruit yield of okra** | | |
| **Sr. no** | **Treatments** | **Fruit yield (q/ha)** |
| D1 | 8th July | 92.32a |
| D2 | 15th July | 82.11ab |
| D3 | 22nd July | 76.61b |
| D4 | 29th July | 72.32b |
| D5 | 5th August | 71.43b |
| S. Em. (Treatment) T | | 355 |
| C. D. at 5% T | | 1094 |
| C. V. % | | 8.99 |
| Treatment means with the letter(s) in common are not significantly different by DNMRT at 5% level of significance | | |

D1 D2 D3 D4 D5

Treatments

Fruit yield (kg/ha.)

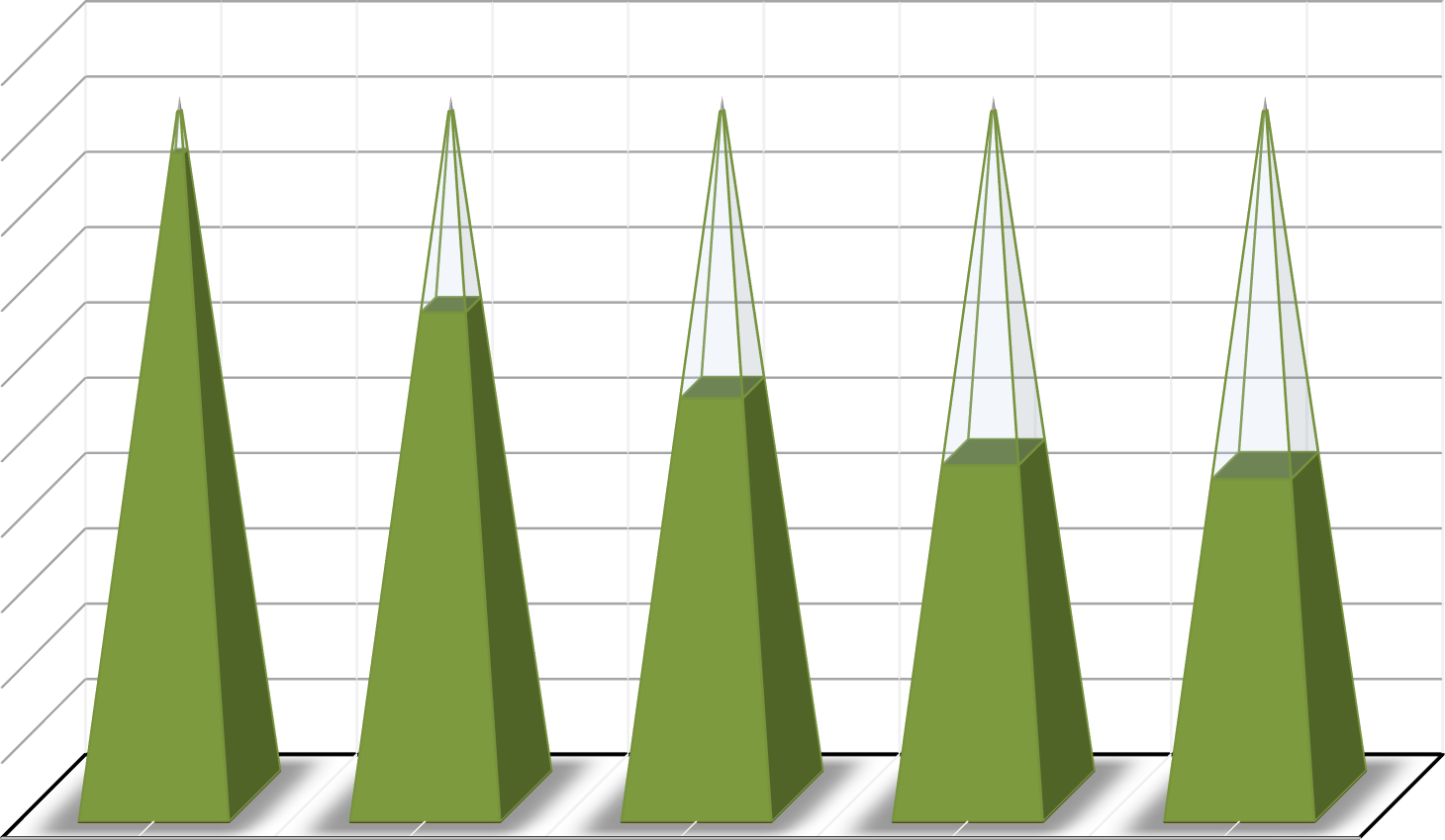


Figure 1: Effect of sowing period on fruit yield of okra