Research Article

ISAH Indian Journal of Arid Horticulture
Year 2025, Volume-7, Issue-2 (July-December)

Identification of best cultivar with suitable sowing time to maximize the pod yield of okra (*Abelmoschus esculentus*) in semi-arid regions of Haryana

Kuldeep Kumar[1], Vikram[1], Makhan Majoka[1], Mukesh Kumar[2] and Rajesh Kumar Arya[3]

[1]Department of Vegetable Science, CCS Haryana Agricultural University, Hisar
[2]CCS Haryana Agricultural University, Regional Research Station, Bawal (Rewari)
[3]MAP Section (GPB), CCS Haryana Agricultural University, Hisar

ARTICLE INFO

Received: 21 September 2025
Accepted: 30 September 2025

Keywords: Okra, Sowing dates, Cultivar, Growth, Pod yield, B: C ratio.

doi:10.48165/ijah.2025.7.2.10

ABSTRACT

Recently released cultivars of okra were studied to standardize the sowing time for particular sowing window during 2021-22 to 2022-23 at the Experimental Research Farm, Vegetable Science, CCS HAU, Hisar (Haryana). In the present study, three cultivars namely, V_1- Hisar Naveen, V_2- Hisar Unnat and V_3- Varsha Uphar were sown on five different dates at an interval 15 days in Factorial RBD with three replications. The results compilation on the basis of two years of experimentation revealed that the okra cultivar, Hisar Naveen sown from 1st July under Haryana conditions produced maximum pod yield (112.55 q/ha) with B:C ratio (2.92), trailed by sowing of 15th July which produced the highest pod yield (110.40 q/ha) with B:C ratio (2.83). Therefore, for optimal okra production and the best benefit-cost ratio under the semi-arid conditions of Haryana, it is recommended to sow the Hisar Naveen okra cultivar between July 1st and July 15th for successful commercial cultivation.

Introduction

Okra (*Abelmoschus esculentus* L. Moench) is also known as ladyfinger. In India, it is very important export oriented rainy and spring-summer season vegetable crop. It ranks first in vegetable production and mainly cultivated in UP, Bihar, Haryana, Punjab, Gujarat, Maharashtra, Karnataka, Tamil Nadu, Odisha and West Bengal (Sood and Kaur, 2019). Globally, it is cultivated in sub-tropical, tropical, and low altitude areas of Asian, African and American countries (Raj *et al.*, 2013 and 2014). The immature green pods are good source of carbohydrates, proteins, vitamin A and C. It also have K, Ca, Mg, and many more minerals, which are usually not found in our daily diet. Moreover, okra has good medicinal value for peptic ulcer because it is cheap source of plasma replacement for human body fluid (Makinde *et al.*, 2022).

The selection of cultivars for a particular sowing time plays very important role to maximize the yield as it gives suitable environment for crop growth and fruit development (Bake *et al.*, 2017). Proper sowing dates favours increase in fruit weight and number of fruits per plant which results in more production (Bake *et al.*, 2017). Opposite to this, late sowing retards growth because of high temperature at the growth and development time, which affects reproductive stage and consequently reduce fruit yield (Ghannad *et al.*, 2014). Moreover, late-sown vegetables attract more diseases and pests (Reddy and Reddi, 2014) and may resulting high infestation of viruses (Sastri *et al.*, 2004). The cultivars found suitable for different planting time, as good high yielding

Corresponding author's Email: rakarayogi@gmail.com (Rajesh Kumar Arya)

cultivars grown at rude times may result less production (Ghannad *et al*., 2014) mainly because of unfavorable temperature, early stimulation of flowering, and rainfall.

For profitable cultivation of a vegetable, the high fruit yielding cultivar is the primary necessity of vegetable growers (Majoka *et al*., 2021; Oo *et al*., 2022 and Oo *et al.*, 2023). Secondly, to explore the full potential of any cultivar, identify the best sowing time for flourishing its growth and ultimately high fruit yield production. Thus, to attain the highest yield of a variety, the identification of the specific planting time is required under a particular climate. The evaluation of different vegetable cultivars under changed dates of sowing delivers appreciates information to the researchers for further enhancement in fruit yield (Ngoc *et al*., 2017; Oo *et al*., 2023) and increase the availability of vegetables for large period. Therefore, keeping the above discussion in view, present research was conducted to find out the best sowing period for crop growth and immature pod production of okra cultivars *viz*., Hisar Naveen, Hisar Unnat and Varsha Uphar.

Material and Methods

The pod yield performance of okra cultivars under different dates of sowing was evaluated from 2021-22 to 2022-23 at the Experimental Research Farm, Vegetable Crops Sciences, CCS Haryana Agricultural University, Hisar, India. The experimental location having latitude of 29°10' N, longitude of 75°46' E and at an altitude of 215.2 m above mean sea level. This area is categorized as semi-arid region accompanied with dry and hot winds in May-June and dry severe cold in December-January. The average temperature of region is 44 - 48°C in summer and -2°C in winter escorted with chill frost (Majoka *et al*., 2021). The maximum rains received in July-September. In the present experiment, three cultivars namely, V_1- Hisar Naveen, V_2- Hisar Unnat and V_3- Varsha Uphar were planted during *Kharif* season on five different sowing dates at 15 days interval i.e. D_1:15 June 2022, D_2: 01 July 2022, D_3: 15 July 2022, D_4: 01 August 2022 and D_5:14 August 2022 in factorial RBD with three replications having plot size of 3.0 m x 2.7m with spacing 60cm x 30 cm. All the agronomic practices recommended by CCS HAU Hisar were followed to raise the good crop (Anonymous, 2023). The data were recorded from five selected plants in each treatment for pod yield per plant (kg), plant height (cm), and pods per plant and subjected to the Factorial RBD statistical analysis as per method prescribed by Panse and Sukhatme, 1985.

Results and Discussion

The results obtained during 2021-22 and 2022-23 on plant height (cm) and average pods/ plant are depicted in Table 1. During 2021-22, maximum plant height was observed 95.10 cm in Hisar Naveen sown on 15 July, while during 2022-23, maximum plant height was observed 97.30 cm in Hisar Naveen sown on 1 July, this difference might be due to seasonal variations in weather parameters. The average of both the years revealed that the sowing date of 15th July recorded significantly taller plants as compared to other sowing dates, which may be due to the occurrence of faster growth under suitable weather regimes, lead to the improved plant metabolic activities like photosynthesis. The early sown (15 June) crop got extra growing time as compared to late sown while it faced high temperature condition during early stage of growth. This might prevalent in the early stages of the vegetative growth, which led to the reduction in plant height. Likewise, the late sowings (1 August & 14 August) received less growing duration as compared to timely sowing while it faced high temperature condition. This might lead to less plant growth and development, thus the reduction in plant height was noticed. According to Das *et al*., 2018, reduction in plant height under late sown condition might be due to high air temperature faced by the crop which lead to stunted growth. Similar research observation were also conveyed by El-Waraky, 2014; Kumar *et al*., 2015 and Sood & Kaur, 2019. The pods/ plant were significantly reduced in early as well as late sowing. Okra sown on 15th July during 2021-22 and 1st July during 2022-23 was recorded the highest pods/ plant (24.10 and 24.70, respectively) due to the suitable weather conditions. These results are in agreement with Tandel *et al*. (2017). The highest number of pods (24.20) on average basis were attained on 1st July and 15th July which may be due to more number of nodes per plant and longer harvesting period accompanied with favorable weather conditions. The number of pods/ plant is one of very essential yield backing parameters and it directly effects the yield. The authors working on okra used different dates and verities reported similar results by Sonu *et al*. (2013), Dash *et al*. (2013) and Undie and Litio (2018).

Table 1. Effect of different dates of sowing on plant height and pods/ plant of okra

Sowing time	Cultivars	Plant height (cm)			Pods/ plant		
		2021-22	2022-23	Mean	2021-22	2022-23	Mean
D_1:15 June	V_1: Hisar Naveen	89.30	93.60	91.45	23.60	24.20	23.90
	V_2: Hisar Unnat	87.10	92.50	89.80	20.90	21.50	21.20
	V_3: Varsha Uphar	88.40	92.70	90.55	21.80	22.40	22.10

D_2: 01 July	V_1: Hisar Naveen	91.40	97.30	94.35	23.70	24.70	24.20
	V_2: Hisar Unnat	90.30	92.50	91.40	22.10	23.30	22.70
	V_3: Varsha Uphar	90.50	94.80	92.65	22.90	24.00	23.45
D_3: 15 July	V_1: Hisar Naveen	95.10	95.70	95.40	24.10	24.30	24.20
	V_2: Hisar Unnat	92.60	89.30	90.95	22.70	22.70	22.70
	V_3: Varsha Uphar	93.50	90.60	92.05	23.40	23.50	23.45
D_4: 01 August	V_1: Hisar Naveen	84.01	87.21	85.61	20.90	21.50	21.20
	V_2: Hisar Unnat	80.26	82.46	81.36	19.30	19.90	19.60
	V_3: Varsha Uphar	81.72	84.92	83.32	20.00	20.60	20.30
D_5:14 August	V_1: Hisar Naveen	62.71	64.91	63.81	17.70	18.30	18.00
	V_2: Hisar Unnat	48.28	50.48	49.38	15.10	15.70	15.40
	V_3: Varsha Uphar	59.97	62.17	61.07	16.20	16.80	16.50
	C.D. Factor (D)	3.26	1.54	-	0.50	0.49	-
	C.D. Factor (V)	1.83	1.19	-	0.40	0.38	-
	C.D. Factor (D x V)	NS	2.66	-			

Table 2. Mean performance on pod yield and B:C ratio of okra

Sowing time	Cultivars	Pod yield (q/ ha)			B:C ratio
		2021-22	2022-23	Mean	
D_1:15 June	V_1: Hisar Naveen	98.70	104.30	101.5	1.92
	V_2: Hisar Unnat	86.40	88.60	87.50	1.53
	V_3: Varsha Uphar	90.10	94.30	92.20	1.66
D_2: 01 July	V_1: Hisar Naveen	105.90	114.90	110.40	2.83
	V_2: Hisar Unnat	90.60	99.50	95.05	2.41
	V_3: Varsha Uphar	95.20	104.90	100.05	2.53
D_3: 15 July	V_1: Hisar Naveen	114.60	110.50	112.55	2.92
	V_2: Hisar Unnat	98.10	94.10	96.10	2.48
	V_3: Varsha Uphar	105.80	97.10	101.45	2.62
D_4: 01 August	V_1: Hisar Naveen	108.20	109.30	108.75	1.89
	V_2: Hisar Unnat	92.30	92.40	92.35	1.45
	V_3: Varsha Uphar	94.50	96.30	95.40	1.54
D_5:14 August	V_1: Hisar Naveen	85.40	90.30	87.85	1.45
	V_2: Hisar Unnat	73.60	78.20	75.90	1.13
	V_3: Varsha Uphar	78.90	81.00	79.95	1.23
	C.D. Factor (D)	6.36	3.35	-	-
	C.D. Factor (V)	4.93	2.13	-	-
	C.D. Factor (D x V)	NS	NS	-	-

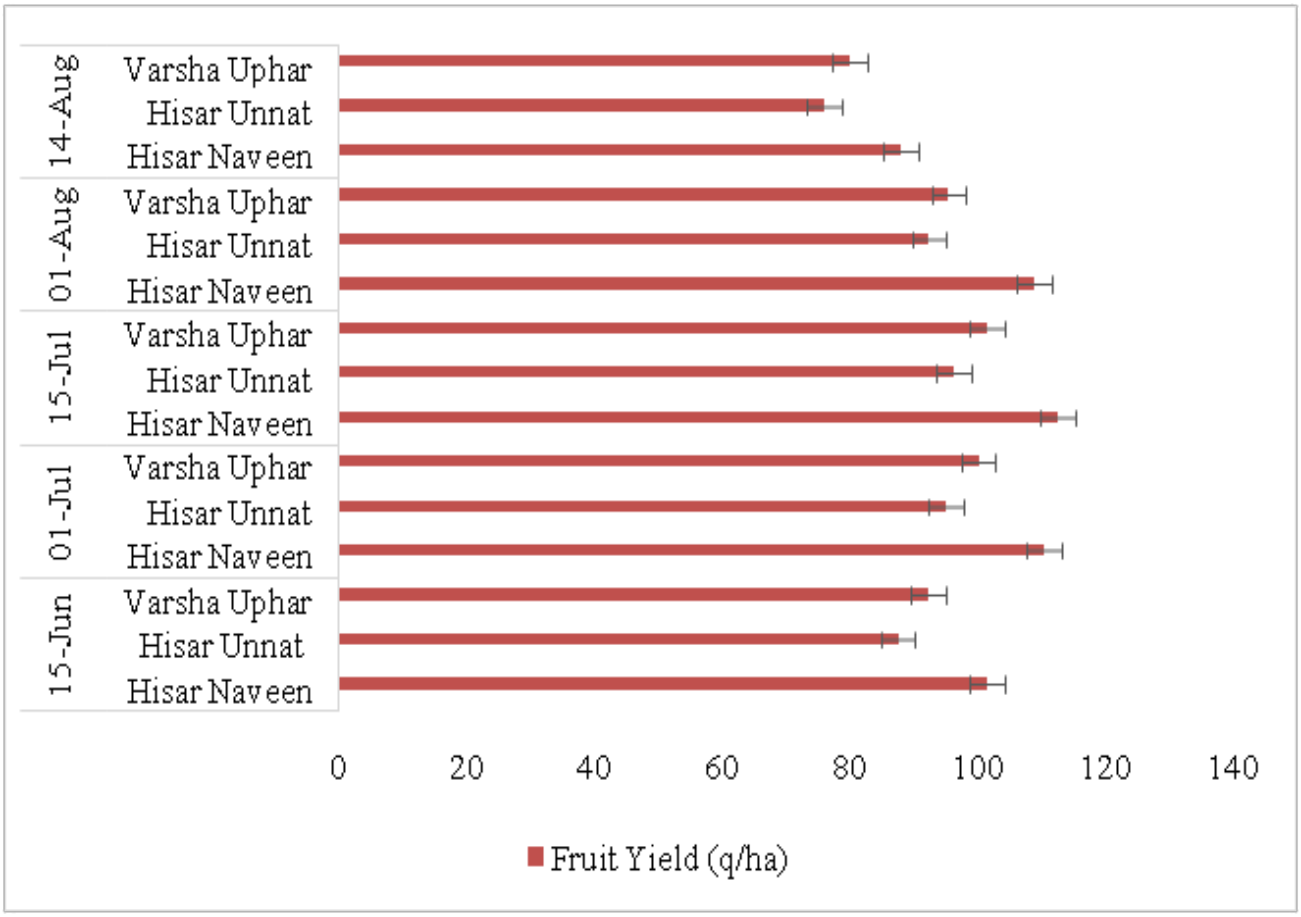

Fig. 1. Effect of sowing dates on pod yield of different okra cultivars

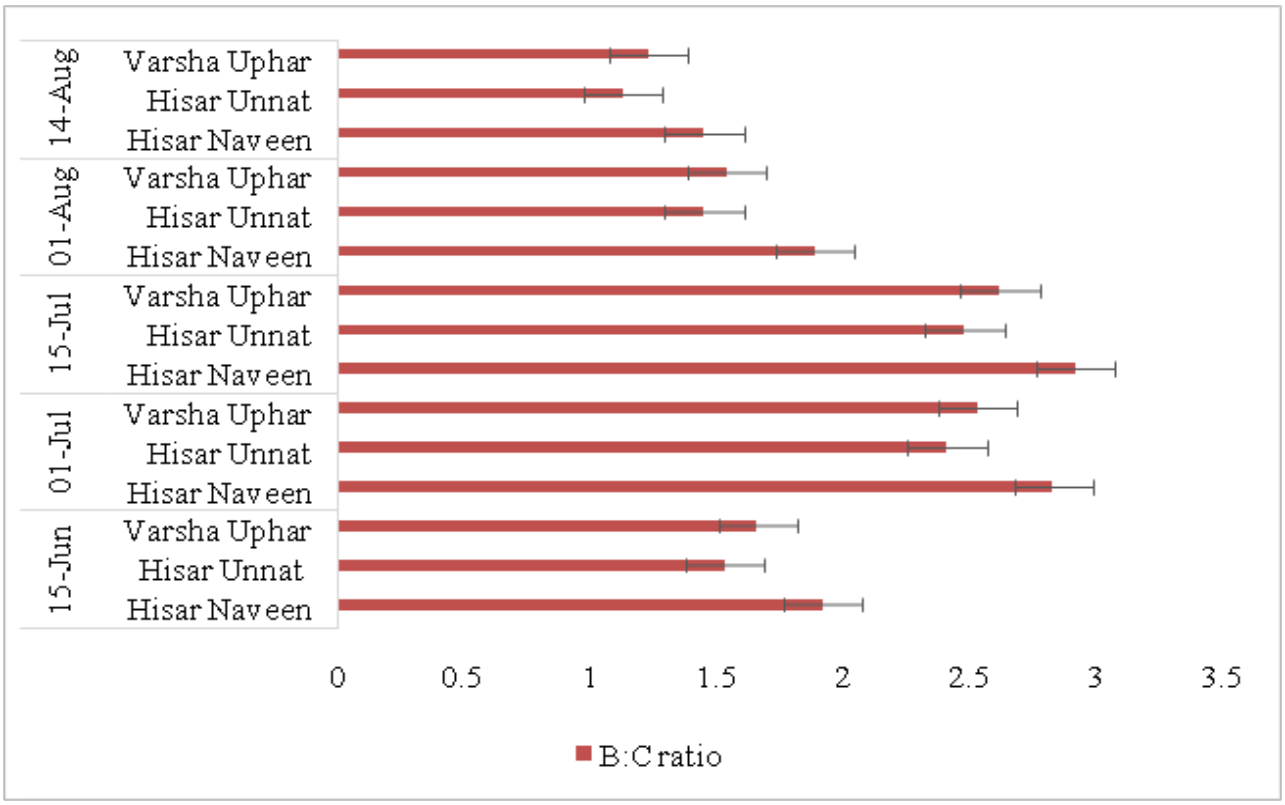

Fig. 2. Effect of sowing dates on pod yield of different okra cultivars

During 2021-22, the effect of change in dates of sowing on growth and pod yield of different okra cultivars found that maximum pod yield (114.60 q/ha) was obtained when okra cultivar Hisar Naveen sown on 15th July which was at par with sowing of 1st August under Hisar conditions. While, during 2022-23, results based on the effect of sowing dates on growth, development and yield of okra cultivars revealed that maximum pod yield (114.90 q/ha) was obtained when okra cultivar Hisar Naveen planted on 1st July which was at par with sowing of 15th July under Hisar conditions (Table 1 and Fig 1). The pod yield performance of the cultivars under different dates of sowing varied from year to year due to seasonal variations in weather parameters.

On the other side, 15th June sowing reflected overall less growth, and development and yield of okra plants due to extreme high temperature, which is not much conducive for okra cultivation and cause period for plant growth and development. Likewise, 1st August and 14th August sowing also faces the lack of moisture and high temperature conditions. The maximum pod yield mottled significantly amongst different sowing periods and interaction of sowing time with variety. This might be happened due to the prevailing favourable climate during the crop growth when crop was sown on 10th March. These findings were reported by earlier researchers i.e. Bake *et al*., 2017, Morwal and Patel, 2017, Das *et al*., 2018, Undie and Litio, 2018 in okra.

The results assemblage on okra discovered that the okra cultivar, Hisar Naveen sown on 1st July under Hisar conditions able to produce the maximum pod yield (112.55 q/ha) with B:C ratio (2.92), which is trailed by sowing of 15th July to produce good pod yield (110.40 q/ha) with B:C ratio (2.83). The maximum immature tender pod yield was recognized due to the favorable response environment in plant growth and pod yield attributes (Table 1 and Fig 2). Therefore, sowing of okra cultivar Hisar Naveen may be suggested from 1st July to 15th July to maximize the okra production and economize the commercial cultivation of okra under semi-arid conditions of Haryana.

Conclusion

The maximum yield of okra cv. Hisar Naveen was observed in the sowing date range of 1-15 July under semi-arid conditions of Haryana. The benefit cost ratio and overall economics was also found more in the same sowing period so the okra cultivar Hisar Naveen may be suggested for sown from 1st July to 15th July.

Acknowledgements

The authors express their gratitude to the CCS Haryana Agricultural University, Hisar for providing the necessary facilities.

Conflict of Interest

The authors have no conflict of interest.

Data Sharing

All relevant data are within the manuscript.

References

Anonymous. 2023. Package and Practices for Cultivation of Vegetables. CCS Haryana Agriculture University, Hisar, 1p.

Bake, I.D., Singh, B.K., Singh, A.K., Moharana, D.P. and Maurya, A.K. 2017. Impact of planting distances and sowing dates on yield attributing traits of okra [*Abelmoschus esculentus* (L.) Moench] cv. Kashi Pragati. *International Journal of Current Microbiology and Applied Sciences,* 6(7): 4112-4125.

Das, S., Pandey, V. and Mishra, S. 2018. Growth and fruit yield of okra as influenced by different growing environment. *International Journal of Agricultural Innovation and Research,* 6(5): 232-234.

Dash, P.K., Rabbani, Md. G. and Mandal, Md. F. 2013. Effect of variety and planting date on the growth and yield of okra. *International Journal of Biosciences,* 3(9): 123-131. http://dx.doi.org/10.12692/ijb/3.9.123-131

El-Waraky, Y.B. 2014. Effect of sowing date, plant density and phosphorous fertilization on seed yield of okra. *Alexandria Journal of Agricultural Sciences,* 59(1): 27-41.

Ghannad, M., Madani, H. and Darvishi, H.H. 2014. Effects of different sowing times, irrigation intervals and sowing methods on okra. *International Journal of Farming and Allied Sciences*, 3(6): 683-689.

Kumar, R., Lata, K., Khadda, B.S., Jadav, J.K. and Rai, A.K. 2015. Effect of sowing time on productivity and economics of okra (*Abelmoschus esculentus*) under semi-arid conditions. *Indian Journal of Agricultural Sciences,* 85(7): 908-911.

Majoka, M., Panghal, V.P.S. and Duhan, D. S. 2021. Effect of nipping and plant spacing on seed production of cowpea in Haryana condition. *Forage Research*, 46 (4): 343-347. http://forageresearch.in

Makinde, A.I., Oyekale, K.O. and Daramola, D.S. 2022. Growth and yield of okra (*Abelmoschus esculentus*) as influenced by fertilizer application under different cropping system. *Journal of Agricultural and Applied Economics,* 22: 29-36.

Morwal, B.R. and Patel, M.C. 2017. Growth and yield of okra (*Abelmoschus esculentus* L) as affected by date of sowing and spacing under north Gujarat condition. *Journal of Krishi Vigyan,* 6(1): 93-96.

Oo, P.P., Panchta, R., Nimbal, S., Kharor, N., Arya, S., Arya, R.K. and Sonu, L. 2023: Variability, character association and genetic divergence studies in cowpea [*Vigna unguiculata* (L.) Walp] genotypes. *Range Management and Agroforestry,* 44 (2): 288-297.

Oo, P.P., Panchta, R., Nimbal, S., Singh, D.P., Kharor, N., Arya, S. and Sonu L. 2022. Morphological characterization of leaf, flower, pod and seed traits of cowpea [*Vigna unguiculata* (L.) Walp] genotypes. *Forage Research,* 48: 50-56.

Panse, V.G. and Sukhatme, P.V. 1985. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi., pp. 87-89.

Raj, D., Dahiya, O.S., Arya, R.K., Yadav, A.K. and Kumar, K. 2013. Improvement in germination characteristics in artificially aged seeds of okra (*Abelmoschus esculentus*) by osmo-conditioning *Indian Journal of Agricultural Sciences,* 83 (7): 699-702.

Raj, D., Dahiya, O.S., Yadav, A.K., Arya, R.K. and Kumar, K. 2014. Effect of natural ageing on biochemical changes in relation to seed viability in okra (*Abelmoschus esculentus*). *Indian Journal of Agricultural Sciences.* 84(2): 280–286.

Reddy, T.Y. and Reddi, G.H.S. 2014. Principles of Agronomy. Kalyani Publishers, Ludhiana., 185p.

Sastri, S.R., Yadav, B.K. and Sankar, B.S. 2004. Effect of planting date and virus infestation on the growth and yield of okra. *South Indian Journal of Horticultural Science,* 15(2): 178-185.

Sonu, Singh, J.P., Rajbeer, Nathiram and Himanshu, K. 2013. Effect of sowing dates and plant geometry on growth and yield of okra cv. Parbhani Kranti and Pusa-4. *Asian Journal of Horticulture,* 8(2): 772-774.

Sood, R. and Kaur, R. 2019. Effect of sowing time on performance of okra [*Abelmoschus esculentus* (L.) Moench] varieties under Jalandhar conditions. *International Journal of Current Microbiology and Applied Sciences,* 8(12): 568-576. https://doi.org/10.20546/ijcmas.2019.812.074

Tandel, B.M., Nayaka, P. and Shah, K.A. 2017. Yield of okra as influenced by the different sowing dates and plant spacing. *International Journal of Chemical Studies,* 5(5): 91-93.

Undie and Litio, U. 2018. Influence of planting date and harvesting sequence on growth and fruit/ seed yields in West African okra {*Abelmoschus caillei* [A.Chev(Stevels)]}. *International Journal of Agriculture and Earth Science,* 4(4): 8-17.

Vu Nguyen Ngoc,V.N., Arya, R.K., Panchta, R. and Tokas, J. 2017. Studies on genetic divergence in cowpea (*Vigna unguiculata*) by using D^2 Statistics under semi-arid conditions. *Forage Research*, 43 (3): 197-201.