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Effect of Nodal Position of Fruits on Seed Quality of Okra (*Abelmoschus esculentus L.* Moench)

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Authors' contributions

This work was carried out in collaboration among all authors. Author Sunil Kumar designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors SSJ and AKM managed the analyses of the study. Author Sangeet Kumar managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The present study was carried out in the field and laboratory of the Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana during 2018-2019 to know the effect of nodal position of fruits on seed quality of okra. The parameters recorded during laboratory studies were i.e. germination, seedling length, seedling dry weight, vigour indices-1 & 2 and field studies were i.e. field emergence index, seedling establishment. The results indicated that the best nodal position of fruits for quality seed production was middle nodes (6^{th} to 10^{th}) as compared to lower nodes (1^{st} to 5^{th}) and upper nodes (11^{th} to 15^{th}) and the control.

Keywords: Okra; seed quality; nodes; fruits.

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1. INTRODUCTION

Vegetables play an important role in providing food nutrition and economic security of the country. They are an important component of human diet for the maintenance of good health. Okra is one of the most commonly known and utilized species of the family *Malvacae*, an economically important vegetable crop grown in tropical and sub-tropical parts of the world Oyelade et al. [1] and Andras et al. [2]. The centre of origin is Ethiopia Satish and Eswar [3]. Thereafter, by the 12th century BC, it was propagated in different parts of world and India Nzikou et al. [4]. India is the global leader in the production of okra Saxena et al. [5].

It has a prominent position among vegetables due to its high nutritive and medicinal value, round the year cultivation, high yield, ease of cultivation, wider adaptability to varying weathers, resistance to various diseases and pests and also the export potential Reddy et al. [6] and Meena et al. [7]. The importance of seed in agriculture is very well known in developing countries like India, where the majority of the population and GDP significantly depend upon agriculture Tyagi [8].

Hedau et al. [9] stated that high quality seeds were obtained from the fruits positioned at middle nodes, followed closely by seeds collected from the lower nodes of the plant. However, seeds obtained from the upper fruits showed lowest seed yield and quality. The effect of position of the fruit on the plant and duration after anthesis has been reported by Yadav and Dhankhar [10] in okra, whereas seed quality was found to be affected by fruit position, seed maturity and growing season Prabhakar et al. [11].

2. MATERIALS AND METHODS

The present investigation was carried out in 2018 at laboratories and 2019 at research farm of Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar and which is situated in semi-arid tropics and located at 29^{0}10 North Latitude and 75 ^{0}46 East Latitudes and at an altitude of about 215.2 m above the mean sea level. Okra seed of *cv.Varsha Uphar* harvested in Oct/Nov 2017 was procured from Department of Vegetable Science, CCSHAU, Hisar and sown in field in June/July 2018.

The mature fruits of okra were harvested at colour change of pod from grey to brown and formation of hairline cracks. Picking of mature pods were done from the lower, middle and upper portions of the plant many a times. The portions of the plant were divided on the basis of node numbers. The lower portion constitutes 1st to 5th node, middle portion from 6th to 10th and upper portion from 11th to 15th node, respectively. The mature pods from each portion were thrashed and separated. Thus, three seed lots formed were evaluated for seed quality parameters against a control *i.e.* seed harvested from whole plant at maturity. The seeds collected from different seed lots were replicated four times for analyzing. The laboratory experiment was laid out in completely randomized design (CRD) and was statistically analyzed by standard method Panse and Sukhatme [12].

2.1 Seed Technological Parameters

2.1.1 Standard germination test (%) as per ISTA [13]

Four hundred seeds for each treatment were placed in three replications in between the germination paper and placed in germinators at 25±1°C. The germination was checked on 10th day and normal seedlings were considered for per cent germination.

Seed germination (%) = Number of seeds germinated / Total number of seeds placed for germination × 100

2.1.2 Seedling length (cm)

Ten normal seedlings per replication were selected at random at the time of final count of standard germination. Seedling length was measured using a measuring scale from tip of shoot to the end of the root and average length was recorded.

2.1.3 Dry seedling weight (g)

Seedling dry weight was assessed after the standard germination test. The ten seedlings of each treatment replicated thrice were taken. Seedlings were dried in hot air oven for 24 h at 80±1°C. The dried seedlings were weighed and average seedling dry weight of each treatment was calculated.

2.1.4 Vigour indices

Seedling vigour indices were calculated according to the method suggested by Abdul-Baki and Anderson [14].

(a) Seed Vigour Index I = Seed germination (%) × Average seedling length (cm)
(b) Seed vigour Index II = Seed germination (%) × Average dry seedling weight (mg)

The field parameters *viz.,* field emergence index and seedling establishment were evaluated.

2.1.5 Field parameters

One hundred seeds of *cv*. Varsha Uphar were sown with three replications during June, 2019. The following observations were recorded in field.

2.1.6 Field emergence (%)

The number of seeds germinated was recorded daily until it completed on 21st day.

Field emergence (%) = Total number of germinated seeds / Total number of seeds sown× 100

2.1.7 Seedling establishment (%)

The seedling establishment was determined on 21st day by counting the total number of seedlings when the emergence was completed or when there was no further addition in the total emergence.

Seedling establishment (%) = Total number of seedlings established /Total number of seeds sown× 100

3. RESULTS AND DISCUSSION

Prabhakar et al. [11] stated that seed quality was found to be affected by fruit position, seed maturity and growing season. The perusal of data in Table 1 showed that the germination percentage of seeds was varied in seeds collected from different nodes and significantly higher germination percentage was recorded in seeds of middle nodes (91%) followed by seeds of lower nodes (85%). The upper node seeds (84%) along with control (84%) recorded the lowest germination. The germination percentage in lower node, upper node and control was statistically at par. This may be due to poor maturity and shrivelled seeds as affected by insects at later periods of harvesting. These findings are in line with those of Bhatt and Rao [15], Rao et al. [16,17] and Verma et al. [18,19] and Hedau et al. [7] in okra.

The higher seedling length was measured in seeds obtained from middle nodes (38.11 cm) which was at par with lower nodes (36.07 cm). The upper node seedling length was 32.33 cm and lowest length was recorded in control (25.13 cm). This was might be due to maximum share of assimilate and water during fruit formation, seed development and maturation by the fruits at lower and middle nodes whereas, higher nodes lag behind in the competition for assimilate as the time available for assimilation of storage reserves was quite less. The similar findings were also reported by Ibrahim and Oladiran [20] and Francis and Opondo [21] in okra.

The significantly higher seedling dry weight was weighed in seeds collected from middle node seeds (0.312 g) followed by the seeds of upper node (0.258 g), lower node (0.254 g) and lowest was weighed in seeds of control (0.234 g). The faster germination resulted better translocation of food reserves to growing seedling may have resulted in erased seedling dry weight, hence resulted in higher dry weight of seedling. These results are similarly to the findings of Bhanuje and Raikar [22], Moniruzzaman and Quamruzzaman [23], Rao et al. [16,17] and Verma et al. [18,19] in okra.

Table 1. Effect of nodal position of fruits on seed quality parameters

Picking stage	Germination (%)	Seedling length (cm)	Seedling dry weight (g)	Vigour index-I	Vigour index-II
Lower nodes	85	36.40	0.254	3093	21.53
Middle nodes	91	38.11	0.312	3494	28.56
Upper nodes	84	32.33	0.258	2715	21.64
Control	83	25.13	0.234	2086	19.40
C.D (5%)	3.21	2.02	0.05	187.30	3.79
S.E (m)	0.97	0.61	0.015	56.55	1.14

Table 2. Study of nodal position of fruits on field parameters

Picking stage	Field emergence index	Seedling establishment
Lower nodes	82.66	71.83
Middle nodes	84.83	76.83
Upper nodes	76.41	69.50
Control	82.00	72.01

The significantly higher vigour index-I was recorded in seeds collected from middle nodes (3494) followed by lower nodes (3093), upper nodes (2715) and lowest was found in seeds collected from control (2086). In case of vigour index-II the highest (28.56) was recorded in seeds collected from middle nodes. Vigour index-II of upper node seeds (23.09), lower node seeds (21.52) and control (19.40) was statistically at par. The results are corroborated with earlier findings of Ibrahim and Oladiran [20] in okra. The reason may be attributed to the plea that lower and middle position fruits remained for longer period on plant and thus absorbed more minerals and nutrients which ultimately decreases towards top of the plant, which results in lower seed weight, reduced vigour and viability in the seeds of upper position fruits.

The results pertaining to field emergence index and seedling establishment revealed significant differences as depicted in Table 2. Maximum field emergence index (84.83) was recorded in seeds of middle nodes followed by seeds of lower nodes (82.66), control (82.00) and lowest was recorded in seeds of upper nodes (76.41). While in case of seedling establishment, the highest was recorded in seeds of middle nodes (76.83) followed by seeds of lower nodes (71.833), control (72.01) and minimum (69.50) was recorded in seeds of upper nodes. The rate of higher germination might be due to bolder seeds that contain greater metabolites for consumption of embryonic growth during germination as stated by Kumar and Uppar [24]. The results are in close conformity with the findings of Anitha et al. [25] in fenugreek whereas Maheshbabu et al. [26] as well as Maryti and Paramesh et al. [27] in soybean.

4. CONCLUSION

The seeds harvested from the fruits developed at middle nodes showed higher germination, seedling length, dry weight of seedlings, vigour indices (I&II), field emergence index and seedling establishment as compared to lower nodes, upper nodes and control. Middle node developed fruit should be utilized for seed production and the fruits developed on upper and lower nodes should be consumed as green vegetable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Oyelade OJ, OAde-Omowaye BI, FAdeomi V. Influence of verities on protein fat contents and some physical characteristics of okra seeds. J. Food Eng. 2003;2:111-114.
2. Andras CD, Andi BS, Orsi F, Lambrou C, Missopolinou-tatala D, Panayiotou C, et al. Super-critical carbon dioxide extraction of okra seeds. J Sci Food Agric. 2005;85: 1415-1419.
3. Satish D, Eswar A. A review on *Abelmoschus esculentus* (okra). Int Res J of Pharm App Sci. 2013;4:129-132.
4. Nzikou JM, Mvoula-Tsieri M, Matouba E, Ouamba JM, Kapseu C, Parmentier M, et al. A study on gumbo seed grown in Congo brazzaville for its food and industrial application. Afric J of Biotech. 2006;21: 2469-2475.
5. Saxena M, Bhatacharya S, Malhotra SK, et al. Horticulture statistics at a glance 2015. Ministry of Agriculture & Farmers Welfare, Government of India, Oxford University Press, New Delhi; 2016.
6. Reddy HM, Biradarpatil NK. Effect of production locations, methods of cultivation and containers on storability of summer groundnut. Karnataka J Agric Sci. 2012;25:47-51.
7. Meena MK, Chetti MB, Nawalagatti CM. Influence of different packaging materials and storage conditions on the seed quality parameters of groundny (*Arachis hypogaea* L.) Int J Pure App Biosci. 2017;5:933-941.
8. Tyagi V. IndIa's agriculture: Challenges for growth & development in present scenario. Int. J. Phy and Soc Sci. 2012; 2(5):116- 128.

9. Hedau NK, Singh G, Mahajan V, Singh SRK, Ghalian A. Seed quality and vigour in relation to nodal position and harvesting stage of okra under mid hills of north-western Himalayas. Indian J Hort. 2010;67:251-253.
10. Yadav SK, Dhankhar BS. Seed production and quality of okra cv. varsha uphar as affected by sowing time and position of fruit on plant. Seed Res. 2001;23(1):47-51.
11. Prabhakar RS, Hegde DM, Srinivas K, Doijode SD. Seed quality and productivity of okra in relation to nodal position of pod. South Indian Hort. 1985;33:115-17.
12. Panse VG, Sukhatme PV. Statistical methods for agricultural workers, 4th Ed., ICAR, New Delhi; 1985.
13. ISTA. International rules for seed testing. Chapter 5: The germination test. International Seed Testing Association, Baserdorf, Switzerland; 2011. ISBN: 978-3- 906549-53-8.
14. Abdul Baki AA, Anderson JP. Vigour determination in soybean seeds by multiple criteria. Crop Sci. 1973;13:630-633.
15. Bhatt RM, Rao NK. Germination response to fruit position and temperature in okra (*Abelmoschus esculentus L.*). Indian J Hort. 1998;55:81-84.
16. Rao RGS, Singh PM, Singh B, Pandey AK, Mathura R. Seed germinability and vigour as influenced by fruit position, season and gravity separation in okra (*Abelmoschus esculentus L.* Moench). *Veg Sci.* 2004; 31:2-13.
17. Rao RGS, Singh PM, Singh B, Pandey AK, Mathura Rai. Seed germinability and vigour as influenced by fruit position, season and gravity separation in okra (*Abelmoschus esculentus L.* Moench). Veg Sci. 2004;31:2.
18. Verma MK, Srivastava BK, Singh MP. Effect of pod position and stage of harvesting on the seed quality of okra (*Abelmoschus esculentus L.* Moench). Veg Sci. 2004;31:73-74.
19. Verma OP, Singh PV, Kushwaha GD. Influence of the order of capsule on seed content and its quality in okra (*Abelmoschus esculentus*). Seed Res. 2004;26:178-179.
20. Ibrahim H, Oladiran JA. Effect of fruit age and position on mother-plant on fruit growth and seed quality in okra (*Abelmoschus esculentus L.* Moench). Int J Sci and Nature. 2011;3:587-592.
21. Francis BO, Opondo K. Influence of drying method and fruit position on the mother plant on seed quality of spider plant (*Cleome gynandra* L.) morpho types from western Kenya. Adv in Apl Sci Res. 2011;3:74-83.
22. Bhanuje T, Raikar SD. Influence of fruit load and green fruit pickings on seed quality of brinjal. Res. Environ. Life Sci. 2016;9(11):1313-1315.
23. Moniruzzaman M, Quamruzzaman AKM. Effect of nitrogen levels and picking of green fruits on the fruit and seed production of okra (*Abelmoschus esculentus* (L.) Moench). J Agric Rural Dev. 2009;7(1-2):99-106.
24. Kumar ASH, Uppar DS. Influence of integrated nutrient management on seed yield and quality of moth bean. Karnataka J Agric Sci. 2007;20(2):394-396.
25. Anitha M, Swami DV, Salomi DRS. Seed yield and quality of fenugreek cv. Lam methi-2 as influenced by integrated nutrient management. The Bioscan. 2015;10(1): 103-106.
26. Maheshbabu HM, Hunje R, Patil NKB, Babalad HB. Effect of organic manures on plant growth, seed yield and quality of soybean. Karnataka J Agric Sci. 2008; 21(2):219-221.
27. Maryti JB, Paramesh R. Effect of integrated nutrient management on seed quality of vegetable soybean (*Glycine max* (L.) Merill) cv. Karune. Leg Res. 2016;39:578-583.

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