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Influence of fruit positions and fruit retention loads on seed quality parameters of okra

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Abstract
An experiment was conducted in 2016 by using Factorial Completely Randomized Design with three replications to find out the influence of fruit positions and fruit retention loads on seed quality parameters of okra. The okra variety, Arka Anamika was tested with 12 treatment combinations (consisted of two fruit retention loads as factor – I and six fruit positions as factor – II) in field experiment at Vegetable research Farm, Kalyanpur, C.S. Azad university of Agriculture and Technology, Kanpur. harvested seeds were subjected to laboratory analysis in the department of Seed Science and technology, C.S. Azad university of Agriculture and Technology, Kanpur. Observations were recorded on seed quality parameters. Significantly highest values for test weight (g), standard germination (%), seed density (g/cc), root length(cm), shoot length(cm), total seedling length (cm), seedling dry weight (g), speed of germination, seed vigour index-I and seed vigour index-II and lowest value for hard seeds (%) were recorded in R_1 (Retention of fruits borne on different nodes for seed purpose and harvesting remaining fruits for vegetable purpose) fruit retention load over R_2 ((Retaining all fruits for seed purpose). Among the fruit positions, P_1 (From fruits borne on 1-3 nodes) position recorded significantly maximum values for all the studied parameters except hard seeds (%). Thus, it is concluded from the research work that for harvesting vigorous and good quality seed, the treatment combination R_1P_1 (Retention of fruits borne on 1-3 nodes for seed purpose and harvesting remaining fruits for vegetable purpose) may be adopted as it exhibited superior performance over other treatment combinations for all the seed quality parameters under study.

Keywords: Seed quality parameters, okra, fruit positions and fruit retention loads

Introduction
Okra (*Abelmoschus esculentus* L. Moench) is widely grown as a vegetable. The immature fruit is eaten green, either fresh or prepared by boiling or frying and used in soups and stews (Bleasdale, 1984) [5]. Its nutritional value lies in its high amount of calcium and phosphorous. It also contains protein, carbohydrate and fibre and some amounts of vitamins (Tindall, 1983) [14]. Because of the nutritional and economic importance of okra, it is imperative that adequate attention be given to ways of producing the seed in such a way that high quality is ensured. The major aim of a gene bank curator is to conserve seeds in a way that would ensure high quality for a long time. Even if storage condition is ideal, seed longevity is still known to be affected by the crop production procedures which are adopted by the farmer. The physiological state at which a seed is harvested and the positions of the fruit on the mother plant are two of such pre-storage factors.

Ability of seeds to produce more number of normal and vigorous seedlings depends on proper seed filling and maturation because the competition for assimilates between fruits and within fruit distresses seed set and development (Bertin, 1995) [2]. Usually, distal fruits get less time to mature and often they are frequently subjected to aberrant high temperatures, untimely rains and severe pest and disease infestations. Late maturing fruits contain immature lighter seeds, which result in more dead, or hard seeds and less vigorous seedlings ultimately reducing the overall germinability (Getzin, 1983) [7]. In okra, seed quality is found affected by fruit position, seed maturity and growing season etc (Prabhakar *et. al.*, 2003) [11].

Among the vegetable crops in which green fruits are directly used as a vegetable, the scarcity of quality seed has always been observed. Okra being an indeterminate in nature it has peculiar fruiting behaviour. The next flowering and fruiting does not take place till previous fruits are not completed. Being it, the maturity of fruits happens in different interval and directly influences the source to sink system. The present investigation has been done to identify the best fruit position and fruit retention load for harvesting vigorous and quality seeds of okra.

Material and methods

The present investigation was carried out in Factorial Completely Randomized Design with three replications. The okra variety Arka Anamika was tested with 12 treatment combinations (consisted of two fruit retention loads as factor – I and six fruit positions as factor – II) during *Kharif* 2016 at Vegetable research Farm, Kalyanpur, C.S. Azad university of Agriculture and Technology, Kanpur. harvested seeds were subjected to laboratory analysis in the department of Seed Science and technology, C.S. Azad university of Agriculture and Technology, Kanpur. The observations were recorded on test weight (g), standard germination (%), hard seeds (%), seed density (g/cc), root length(cm), shoot length(cm), total seedling length (cm), seedling dry weight (g), speed of germination, seed vigour index-I [germination x seedling length (cm)] and seed vigour index-II [germination x seedling dry weight (g)] by adopting methods as prescribed by International Seed Testing Association (ISTA) procedure (Anon., 2014) [1].

Results and Discussion

The fruit positions and fruit retention loads showed significant difference on all the studied seed quality parameters of okra. The data have been analyzed statistically and presented in Table- 1, 2 and 3.

Influence of fruit positions and fruit retention loads on seed quality parameters

Influence of fruit positions and fruit retention loads on standard germination % and per cent hard seeds exhibited significant differences (Table -1). Significantly maximum (80.00%) germination was recorded by R_1 over R_2 (77.13%). Fruit positions exhibited significant differences on standard germination (%). The position of the fruit, P_1 (From fruits borne on 1-3 nodes) recorded significantly highest (84.54%) germination. Significantly minimum (67.98%) germination was recorded in P_3 (From fruits borne on above 8th nodes) position of the fruit. Lowest germination percentage in the seeds of upper position fruits may be due to poor maturity and shrivelled seeds affected by insects at later periods of crop harvesting. Seeds obtained from lower and middle position fruits were found to be of better vigour and viability as compared to seeds of upper position fruits. The findings are in accordance with the findings of Thomas *et al*. (1979) [13].

Significantly lowest per cent hard seeds were recorded in R_1 fruit retention load (5.98%) over R_2 fruit retention load (8.18%). The P_1 fruit position recorded significantly minimum (5.44%) hard seeds while maximum was found in P_3 (10.41%) fruit position. The numbers of hard seeds varied with the fruit position, the proportion of hard seeds were significantly lower in fruit harvested from lower and middle nodes. This may be reasoned out to fruits at lower nodes get maximum share of assimilate and water during fruit formation, seed development and maturation. Incidentally, fruits at higher nodes lag behind in the competition for assimilate as the time available for assimilation of storage reserves is quite shorter.

Furthermore, the seed quality assessed by test weight, root length, shoot length, total seedling length, seedling dry weight, seed vigour index-I and II, seed density and speed of germination exerted significant differences due to fruit retention loads (Table-1, 2 and 3). The fruit retention load R_1 (Retention of fruits borne on different nodes for seed purpose and harvesting remaining fruits for vegetable purpose) recorded significantly higher values for test weight (64.75g), root length (14.15cm), shoot length (19.84 cm), total seedling length (34.00 cm), seedling dry weight (0.229 g), seed vigour index –I (2762.39), seed vigour index –II (18.46), seed density (16.07 g/cc) and speed of germination (18.28) over R_2. It may be attributed to the reason that retaining selected fruits for seed purpose on the plant absorbed more nutrients and minerals as compared to retaining all fruits for seed purpose on the same plant. The similar findings were also reported by Francis and Opondo (2011) [7], Ibrahim and Oladiran (2011) [9], Grewal *et al.* (1972) [8] and Bhatt and Srinivasa Rao (1998) [4] in okra.

Similarly, test weight, seed density, shoot length, root length, total seedling length, seedling dry weight, seed vigour index-I and II and speed of germination exhibited significant differences due to positions of fruit(Table-1, 2 and 3). Among the fruit positions, the P_1 (Collection of seeds from 1-3 nodes) fruit position recorded significantly maximum test weight (73.12 g), seed density (18.96 g/cc), root length (14.72 cm), shoot length (20.69 cm), total seedling length (35.62 cm) seedling dry weight (0.276 g), seed vigour index-I (3002.57), seed vigour index –II (23.40) and speed of germination (19.87). It may be attributed to the reason that lower position fruits remained on the plant for longer period of time and thus absorbed more nutrients and minerals which go on decreasing towards the top of the plant, there by resulting in lower seed weight, reduced vigour and viability in seeds of upper position fruits. Similar results were also recorded by Bhanuje and Raikar (2016) [3], Moniruzzaman and Quamruzzaman (2009) [10], Bhatt and Srinivasa Rao (1998) [4], Rao *et al*. (2004) [12] and Verma *et al*. (2004) [15] in okra.

Table 1: Influence of fruit positions and fruit retention loads on test weight, standard germination %, hard seeds % and seed density (g/cc) of okra.

Treatments	Test weight			Standard germination %			Hard seeds %			Seed density(g/cc)		
	R_1	R_2	Mean	R_1	R_2	Mean	R_1	R_2	Mean	R_1	R_2	Mean
P_1	74.16	72.09	73.12	86.31	82.78	84.54	4.11	6.77	5.44	19.55	18.37	18.96
P_2	72.47	70.21	71.34	83.82	80.09	81.95	4.61	6.92	5.76	16.11	15.45	15.78
P_3	50.58	46.39	48.48	69.67	66.29	67.98	9.57	11.25	10.41	13.94	13.05	13.49
P_4	63.78	61.60	62.69	82.44	80.79	81.61	5.03	7.38	6.20	16.34	14.54	15.44
P_5	62.21	58.63	60.42	79.53	76.85	78.19	6.71	8.86	7.78	14.30	13.94	14.12
P_6	65.33	59.44	62.38	78.26	75.99	77.12	5.89	7.94	6.91	14.18	13.81	13.99
Mean	64.75	61.39	63.07	80.00	77.13	78.56	5.98	8.18	7.08	16.07	14.86	15.46
Comparing	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)
R	1.86		0.89	1.42		0.68	0.49		0.24	0.82		0.41
P	3.22		1.55	2.47		1.19	0.86		0.41	1.48		0.72

Table 2: Influence of fruit positions and fruit retention loads on root length (cm), shoot length (cm), total seedling length (cm) and seedling dry weight (g) of okra.

Treatments	Root length (cm)			Shoot length (cm)			Total seedling length (cm)			Seedling dry weight (g)		
	R_1	R_2	Mean	R_1	R_2	Mean	R_1	R_2	Mean	R_1	R_2	Mean
P_1	15.12	14.33	14.72	21.56	19.82	20.69	36.68	34.56	35.62	0.296	0.257	0.276
P_2	14.94	14.14	14.54	20.79	19.16	19.97	35.66	33.57	34.61	0.232	0.205	0.218
P_3	12.81	11.91	12.36	18.11	17.24	17.67	30.92	29.32	30.12	0.193	0.171	0.182
P_4	14.42	13.34	13.88	20.72	19.09	19.90	35.21	32.97	34.09	0.226	0.201	0.213
P_5	13.69	12.90	13.29	18.90	17.37	18.13	32.59	30.60	31.59	0.209	0.186	0.197
P_6	13.97	13.01	13.49	19.01	18.19	18.60	32.98	31.35	32.16	0.219	0.181	0.195
Mean	14.15	13.27	13.71	19.84	18.47	19.15	34.00	32.06	33.03	0.229	0.200	0.213
Comparing	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)
R	0.54		0.28	0.33		0.16	1.26		0.61	0.015		0.007
P	1.03		0.49	0.58		0.28	2.19		1.06	0.026		0.013

Table 3: Influence of fruit positions and fruit retention loads on speed of germination, seed vigour index-I and seed vigour index-II of okra.

Treatments	Speed of germination			Seed vigour index-I			Seed vigour index-II		
	R_1	R_2	Mean	R_1	R_2	Mean	R_1	R_2	Mean
P_1	20.46	19.29	19.87	3144.27	2860.87	3002.57	25.54	21.27	23.40
P_2	19.37	18.79	19.08	2989.02	2789.53	2889.27	19.44	16.09	17.76
P_3	16.91	16.25	16.58	2210.62	2053.00	2131.81	13.44	11.33	12.38
P_4	18.23	17.52	17.87	2943.10	2796.94	2869.77	18.63	16.56	17.59
P_5	17.66	17.01	17.33	2654.71	2749.18	2701.94	16.62	14.29	15.45
P_6	17.09	16.33	16.71	2632.66	2515.26	2573.96	17.13	13.75	15.44
Mean	18.28	17.53	17.90	2762.39	2627.38	2694.88	18.46	15.54	17.00
Comparing	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)	CD at 5%		S.E. (d)
R	0.48		0.23	111.52		55.71	1.07		0.51
P	0.84		0.41	199.23		96.50	2.12		1.05

(a) Fruit retention (R)

R_1: Retention of fruits borne on different nodes for seed purpose & harvesting remaining fruits for vegetable purpose.

R_2: Retaining all fruits for seed purpose.

(b) Collection of seeds from different fruit positions (P)

P_1: From fruits borne on 1-3 nodes.

P_2: From fruits borne on 4-8 nodes.

P_3: From fruits borne on above 8^{th} nodes.

P_4: From fruits borne on 1-8 nodes.

P_5: From fruits borne on 4^{th} node & onwards.

P_6: From all nodes.

Conclusion

From above findings, it can be concluded that for harvesting vigorous and best quality seed, the treatment combination R_1P_1 (Retention of fruits borne on 1-3 nodes for seed purpose and harvesting remaining fruits for vegetable purpose) may be adopted as it exhibited superior performance over other treatment combinations for all the seed quality parameters under study.

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References

1. Anonymous. International Rules for Seed Testing by International Seed Testing Association. Seed Sci. and Tech. 2014; 27:214-215
2. Bertin N. Competition for assimilates and fruit position affect fruit set in indeterminate green–house tomato. Ann. Bot. 1995; 75:55-65.
3. 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.
4. Bhatt RM, Srinivasa Rao NK. Germination response to fruit position and temperature in okra (*Abelmoschus esculentus* L.). Indian J Hort. 1998; 55(1):81-84.
5. Bleasdale JKA. Plant physiology in relation to horticulture: 2nd edition published in collaboration with the Horticultural Education Association and Royal Horticultural Society, 1984, 4-5.
6. 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; 2(3):74-83.
7. Getzin LW. Damage to inflorescence of cabbage seed plants by the pale legume bug (Heteroptera: Miridael. J Econ. Entom. 1983; 76:1083-1085.
8. Grewal BS, Nandpuri KS, Kumar JC. Effect of date of sowing, spacing and picking of green pod on seed production of okra. Punjab Hort. J. 1972; 12:248-254.
9. 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. J. S. N. 2011; 2(3):587-592.
10. 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.

11. Prabhakar RS, Hegde DM, Srinivas K, Doijode SD. Seed quality and porductivity of okra in relation to nodal position of pod. South Indian Hort. J. 2003; 12:115-118.
12. 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.
13. Thomas JF, Biddington NL, Toole DF. Relationship between position on parent and dormancy characteristics of seeds of three cultivars of celery (*Apium gradvedus*). Seed Sci. and Technol. 1979; 26:309-318.
14. Tindall HD. Vegetables in the tropics. Macmillan Education Ltd. Houndmills, Basingstoke. Hampshire 12G212XS and London, 1983, 347-378.
15. Verma OP, Singh PV, Kushwaha GD. Influence of the order of capsule on seed content and its quality in okra (*Abelmoschus esculentus*). Seed Res. (New Delhi). 2004; 26:178-179.