Growth Performance of Early Okra (*Abelmoschus esculentus*) Influenced by Seed Priming

Abstract

Seed priming is a pre sowing seed treatment technique that improves growth performance in the field and hence boost subsequent germination, growth and yield of the crop. This study was conducted at Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat during February to May, 2019 to determine the effect of seed priming and priming duration on growth performance of early okra. The experiment was conducted following Randomised Block Design with three replications. Seed priming of okra seeds was done by soaking the seeds for 12 or 24 hrs in distilled water, KCl, PEG 6000 and GA_3.Whereas unprimed dry seeds represented the control. Results indicated that all the characters, such as plant stand per plot, plant height at harvest, branches per plant, days to 50 % flowering, days to first fruiting, days to 50 % fruiting showed improved results in seed priming treatment Osmopriming with 5 % PEG-6000 for 24 hrs followed by halopriming with 1 % KCl for 12 hrs over unprimed dry seed. The results obtained clearly showed positive correlation of seed priming with plant growth, flowering, fruiting and root morphological traits.

Key word: Okra, Priming, PEG-6000, Growth

1. INTRODUCTION

The Okra (*Abelmoschus esculentus* L.) belongs to family Malvaceae well known for its high nutritional value rich in vitamins and minerals, thiamine, vitamin B6, folic acid, riboflavin, vitamin B2, zinc, dietary fiber and seed protein. Okra seed is a source of oil which are also used as a coffee substitute, while powered okra seeds have been used as an aluminium salt substitute in water purification [4]. Okra is the export-oriented crop and covers an area of 513 thousand hectares with productivity of 6176 thousand MT [2]. Maharashtra, Madhya Pradesh, Karnataka are the major okra exporting states of India [9]. It is grown in tropical and subtropical climate in plains and in summer in hills for its tender pods which are eaten as vegetable. Okra favours warm and humid conditions for good growth and development and can be grown successfully under the temperature ranging between 25^{o}-35^{o}C but susceptible to very low temperature. During early season low temperature is the major problem for the germination of seeds. Pre sowing priming treatments can improve the germination under low temperature stress conditions. It activated some of the metabolic process necessary for germination to occur, accelerate synthesis of some enzymes that facilitate the mobilization of storage reserve in the seeds, may increase resistance to abiotic stresses [5]. To overcome the problem of slow and erratic emergence in early okra an experiment was conducted to study the growth of early okra treated by different priming agents and soaking duration.

2. MATERIALS AND METHODS

The experiment was conducted at Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat to assess the impact of different priming agents and priming durations on growth parameters of okra variety F1 Hybrid KSP-1208 recommended for growing in early summer season in Assam conditions. The soil texture of the experimental area was sandy loam with pH 5.2. The crop experienced mild winter climate with maximum temperature 28.9^{o}C. The trial was design in RBD with nine treatments replicated trice. The treatments were T0: Control (Dry seeds), T1: Hydropriming with distilled water for 12 hrs, T2: Hydropriming with distilled water for 24 hrs, T3: Halopriming with 1 % KCl for 12 hrs, T4: Halopriming with 1 % KCl for 24 hrs, T5: Osmopriming with 5% PEG 6000 for 12 hrs, T6: Osmopriming with 5 % PEG 6000 for 24 hrs, T7: Hormonal priming with 50 ppm GA_3 for 12 hrs, T8: Hormonal priming with 50 ppm GA_3 for 12 hrs. The pre-soaked seed were sown on 5th of February 2019 at a spacing of 40cmx25cm. The number of plants per plot was 48. The experimental data collected at the time of last harvest were analysed statistically by using Fisher's method of analysis of variance in randomised block design [8].

3. RESULTS AND DISCUSSION

Plants stand for each priming and soaking treatments under field experiment presented in Table 1 showed significant difference among the treatments. The highest plant stand per plot of 47 plants was found in treatment T3 (Halopriming with 1 % KCl for 12 hrs), followed by 45.67 plants in T5 (Osmopriming with 5 % PEG 6000 for 12hrs) and T6(Osmopriming with 5 % PEG 6000 for 24hrs). The lowest plant stand 31.67 plants per plot was found in control (T0). Osmopriming not only improves seed germination but also enhances crop performance. KCl primed seed showed high plants stand due to increased activities of amylase and protease in the germinated seeds and k^{+} ions can be absorbed by plant cells and may activate many enzymes that are essential for photosynthesis and respiration and in the formation of starch and protein [5]. Plant height (Table 1) is a complex phenomenon and is a result of cumulative effects of many factors, planting densities, light, plant growth pattern, availability of nutrients and age may play important role in increase or decrease plant height. In the experiment it was observed that plant height at harvest with primed seed showed maximum height 108.03cm in T6 which was statistically significant with T3 (105.17cm). Non primed plant showed significantly low plant height. The results of the present experiment corroborate the findings of [6,7,3]. The increase plant height may be due to rapid cell division in meristematic region, number of cells and increase in cell elongation due to multiplication of various parts of the plants tissue, auxin metabolism, cell membrane permeability [10]. The (Table 1) highest number of branches and nodes per plants was recorded in T6 (1.93,18.41) statistically at par with T3 (1.67,17.55) respectively. The lowest number of branches and number of nodes per plant was recorded in T0 control (1.07,12.43) respectively. Number of branches and nodes are the major component which determines the final yield. Ullah *et al*. [11] reported that priming increased number of primary branches and nodes per plant. The results (Table 1) of root biomass were found maximum in T6 (12.92 g) followed by T3 (12.39 g). Data pertaining to root volume the highest root volume was recorded in T6 (33.76 cc) found to be at par with T2 (32.46 cc). Root

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morphological traits increased by application of seed priming substances like PEG and KNO_3 solution were reported by [1].

Table 1: Effect of seed priming and priming duration on growth performance of early okra

Treatments	Plant stand per plot	Plant height at harvest	Branches per plant	Nodes per plant	Root biomass (g)	Root Volume (cc)
T0	31.67	74.51	1.07	12.43	10.44	26.96
T1	41.00	97.03	1.27	14.26	11.65	29.74
T2	39.00	82.78	1.40	13.95	11.26	32.46
T3	47.00	105.17	1.67	17.55	12.39	30.32
T4	44.67	100.10	1.53	15.51	11.59	29.61
T5	45.67	97.23	1.53	16.92	11.70	29.80
T6	45.60	108.03	1.93	18.41	12.92	33.76
T7	40.00	90.49	1.53	16.62	11.63	29.36
T8	38.67	87.70	1.40	15.84	11.57	29.00
S.Ed(±)	0.97	1.04	0.18	0.49	0.19	0.73
CD at 5%	2.06	2.20	0.38	1.02	0.40	1.55

Days to first and 50 % flowering and fruiting (Table 2) were recorded in different treatments. Among the treatments T6(Osmopriming with 5 % PEG 6000 for 24 hrs) took minimum of 44.67 and 47.00 days to first flowering and 50 % flowering followed by 47.00 days and 48.67 days in treatments respectively in T3(Halopriming with 1 % KCl for 12 hrs). The same trend with least days of 46.67 and 48.00 days to first and 50 % fruiting was also found in the treatment osmopriming with 5 % PEG 6000 for 24 hrs, followed by 47.67 days and 50.33 days in halopriming with 1 % KCl for 12 hrs and the highest of 56.33 days and 59.67 days to first and 50 % fruiting was found in T0(control-dry seed). Primed seeds often germinate and emerge more rapidly than non- primed seeds, especially at low temperature [12]. Early emergence of the seed in the field condition may cause early flowering and fruiting in primed seeds which is delayed in non-primed seeds due to slow and erratic germination.

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Table 2: Effect of seed priming and priming duration on flowering and fruiting of early okra

Treatments	Days to first flowering	Days to 50% flowering	Days to first fruiting	Days to 50% fruiting
T0	54.00	57.67	56.33	59.67
T1	50.67	54.00	52.67	55.33
T2	50.33	54.00	52.33	55.33
T3	45.67	48.67	47.67	50.33
T4	46.67	50.00	49.00	51.67
T5	48.33	52.00	50.67	53.33
T6	44.67	47.00	46.67	48.00
T7	47.33	50.67	49.67	52.33
T8	47.67	51.00	50.00	52.67
S.Ed(±)	0.98	1.11	0.99	1.38
CD at 5%	2.08	2.36	2.11	2.96

4. CONCLUSION

Based on the results obtained from the investigations it can be concluded that different priming treatments exhibited marked influence on the growth parameters of early okra. Hence, it can be suggested that performance of growth and flowering parameters of early season okra can be improved by seed priming treatment with 5 % PEG-6000 for 24 hrs followed by 1 % KCL for 12 hrs.

REFERENCES

1. Abdnadani RR and Ramezani M. The physiological effects on some traits of osmopriming germination of maize (Zea mays L.), rice (Oryza sativa L.) and cucumber (Cucumis sativus L.). Int. J. Agron.2012; 4132- 4148.
2. Anonymous. Horticulture statistics at a glance. Department of Agriculture, Co-operation and Farmers' Welfare Horticulture Statistics Division.2018; Pp.196.
3. Bakare SO and Ukwungwu MN. On farm evaluation of seed priming technology in Nigeria. African Journal of General Agriculture. 2009; **5**(2):93-97.
4. Camciuc M, Bessière JM, Vilarem G, Gaset A. Volatile components in okra seed coat. Phytochemistry.1998;**48**(2): 311-315
5. Farooq M, Basra SMA, Rehman H, Saleem BA. Seed priming enhances the performance of late sown wheat by improving chilling tolerance. J. Agron. Crop. Sci. 2008; 194: 55-60.
6. Guan YJ, Hu J, Wang XJ and Shao CX. Seed priming with chitosan improves maize germination and seedling growth in relation to physiological changes under low temperature stress. Journal of Zhejiang University of Science B. 2009;**12**(6): 427-433
7. Mohammadi G. The effect of seed priming on plant traits of late spring seeded soyabean (Glycine max L.). American Eurasian Journal of Agricultural and Environmental Science. 2009; **5**(3):322-326.
8. Panse VG and Sukhatme PV. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, 1978.
9. Sandyrani GM. Influence of seed treatment of fresh and aged hybrid cotton seeds. J. Sci. Agro. 2002;**45**: 390-391.
10. Thamburaj S and Singh N. Text Book of Vegetables, Tuber Crops and Spices, I.C.A.R., New Delhi. 2001; pp.351- 363

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11. Ullah MA, Sarfraz M, Sadiq M, Mehdi S and Hassan G. Effect of Pre-Sowing Seed Treatment with Micronutrients on Growth Parameters of Raya. Asian journal of plant Sciences. 2002;**1**(1):22-23
12. Zheng GH, Wilen RW, Slinkard AE and Gusta LV. The enhancement of canola seed germination and seedling emergence at low temperature by priming. Crop Sci. 1994; **34**(6):1589-1593.

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