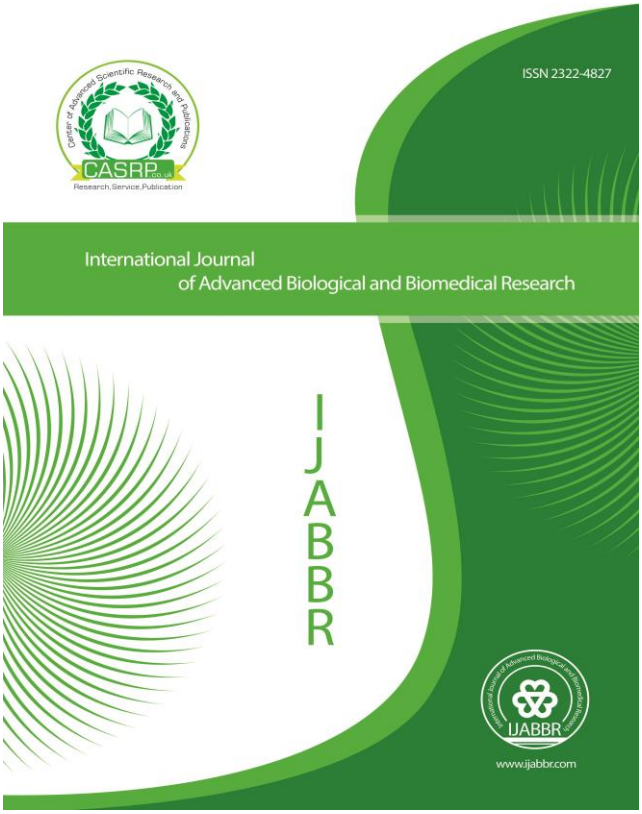
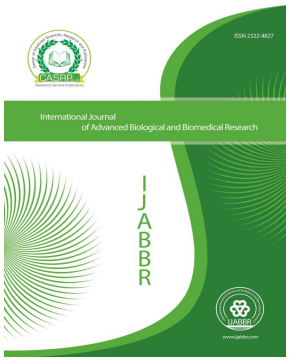


Available online at www.casrp.co.uk/journals

CASRP PUBLISHER

International Journal of Advanced Biological and Biomedical Research 4(3) (2016) 312–318



Original Article Open Access

Effect of different sowing dates on Azivash (*Corchorusolitorius*) seed quality

Mohammad Hossein Ghorbani[1,*], Akram Pasandideh Tashakori[2]

[1]*Department of Agronomy, Gorgan University of Agricultural Sciences and Natural Resources, Iran.*

[2]*Former M.Sc Student of Department of Plant Breeding and Biotechnology, Gorgan University of Agricultural Sciences and Natural Resources, Iran.*

Abstract

This study was conducted at the Gorgan University of Agricultural Sciences and Natural Resources farm, Iran, Golestan province with about 600 mm annual rainfall in order to evaluate the effect of different sowing dates on Azivash (*Corchorusolitorius*) seed quality, using a randomized complete block design with three replications on 2013. Treatments were four sowing dates such as May 5, Jun 5, Jul 11 and Agu 6. After seed maturity and harvesting, a seedling growth tests were done for each sowing date treatment in four replications. It used 25 number seeds in each replication. Seedling growth test was performed by BP (between paper) method for 7 days at 25C in incubator. The results showed that effect of sowing date treatment was significant on normal seedling percentage, abnormal seedling percentage, non-geminated seeds percentage and radicle and hypocotyl length. Mean comparison results showed that maximum normal seedling was recorded in Jun 5, Jul 11 and Agu 6 sowing dates. Minimum non-germinated seeds were recorded in Jul 11 sowing date. Also, seeds of Jul 11 sowing date treatment had the highest hypocotyl and radicle length. With regard to these founding and positive correlation between radicle length and normal seedling percentage and hypocotyl and radicle length with abnormal seedling percentage Jul 11 sowing date is the best sowing date for Azivash (Wild okra) cultivation in Gorganregional at Golestan province because of production of highest normal seedling production, lowest non-germinated seeds and longer hypocotyl and radicle length that result to highest seed quality and vigor.

***Corresponding author:** m.ghorbani@gau.ac.ir

Received 19 November 2016 | Accepted 18 December 2016 | Available online 25 December 2016
iThenticate screening 22 November 2016 | English editing 15 December 2016 | Quality control 21 December 2016

Keywords: Germination, Seed quality, Sowing date, Wild okra.

1. Introduction

Wild okra (*Corchorusolitorius*) is a crop that had possibility of taking it in the form of fresh vegetable, used in salads and cooked either fresh or dried is very useful medicinal unknown plant in Iran. There is no scientific research on harvested seed vigor of wild okra in Iran. Therefore, the aim of this study is effect of sowing date on harvested seed vigor of wild okra in Gorgan environmental condition. Seed quality plays an important role in crop growth and production. Weak germination and inadequate seedlings establishment decreases crop yield and failed to production. There are numerous reports about the effect of density, irrigation, salinity, temperature and other environmental factors on seed vigor produced by crops. Ghorbani et al. (2003) reported that salt stress reduce growth and yield of wheat but had not significant effect on seedsvigor that produced in salt stress condition. Hossain et al. (1996) reported that seed quality increase yield production of wild okra up to 20%. Mahbubul et al. (2002) reported that effect of spices on wild okra seed vigor was significant and *Corchoruscapsularis* seeds vigor was less than *Corchorusolitorius.* Ali et al. (2004) reported that sowing date had significant effect on seed vigor of wild okra so that Sep 15 sowing date had higher seed vigor after accelerated ageing test compared to Jul 2, Agu 2 and Oct 3 sowing dates.

Some researchers reviled that sowing date had the significant effect on seed quality. During seed production process different environmental factors can influence on seed yield and quality. Increase of critical approach to seed quality required for modern methods of vegetable production, we will have to make a greater distinction between seed quality and seed yield. In each ecological system different cultivars require different climatic condition as well as different sowing time and a good cultivar sown at improper time to give poor yield. Therefore, proper and suitable date of sowing is critical for seed production of the crop. Sowing date has a significant effect on okra seed production and quality (Singh et al., 1986; Hossain et al., 1999; Yadav and Dhankar, 2001; Moniruzzaman et al., 2007). Adetunji and Chheda (1989) suggested that where limited resources prevent the use of several locations, different dates of planting for two or more years could be used to evaluate okra varieties for seed yield without losing much information on their relative ranking.

Genetic control some qualitative parameters of seed quality and quantity (Seddique et al., 2002). However, genetic is expressive under normal and appropriate environmental and technological environment conditions (Blum and Punel, 1990). During growth and development assimilates and nutrients that absorbed by embryo during embryogenesis translocated into the seeds. However, except the seed coat, the embryo is the whole of seed. Therefore, the growth and development of seeds have a main effect on embryo size, which influenced by environmental factors (Amlak, 1983). Linseeds quality is variable. Seed germination is closely related to the seed size and seeds that are late developed capsules are smaller and had the lower germination percentage (Harper and Obeid, 1967). However, this experiment was carried out in order to evaluate the effect of different sowing dates on wild okra seed quality in Gorgan regional condition.

2. Materials and methods

This experiment was laid out in order to study on effect of sowing date on harvested seed vigor in Gorgan environmental condition of Gorgan University of Agricultural Science and Natural Resource at 2013. No 1 farm was located at the west of Gorgan-Kordkuy 7 Km old road. Gorgan with 607 mm of rainfall had temperature averages 13C. According to Coupon climatic division Gorgan is Mediterranean warm and semi-humid climates with 54° East longitude, 37° N latitude and 13 m height from sea surface (Safahani et al., 2008) (Table1).

2.1. Plant material

The experiment was laid out randomized complete block design with three replications. Treatments were four sowing dates such as May 5, Jun 5, Jul 11 and Agu 6. Wild Okra seeds with 1000 grain weight about 1.5g are very tiny and required to appropriate cultivation. To achieve a soft and convenient seed bed for seed water absorption, germination, emergence and establishment of wild okra seedlings cultivation was done at April, and was conducted three discs before planting at May. In this experiment used 200 kg/ha50:100:50 rate of NPK. Manual seed planting was performed with 30cm row spacing as 33 plants per square meter. Due to small seeds,

sowing depth was 2cm and performed 2-3 irrigation within 3 to 4 days until emergence to plant establishment because of drying the soil surface. After seedlings establishment, flooded irrigation was about 10 days once due to weather conditions. Manual weeds control was done by Hoe. After emergence, 50 kg/ha nitrogen fertilizer was applied before irrigation when the plant height was 30 cm.

Table 1
Minimum and maximum temperature mean, mean temperature and rainfall mean from sowing to harvest of wild okra in Gorgan region.

Meteorological components	**May 6-Jun 5**	**Jun 6-Jul 6**	**Jul 7-Aug 6**	**Aug 7-Sep 6**	**Sep 7-Oct 7**	**Oct 8-Nov 6**
Minimum temperature average (°C)	16.7	21.5	24.1	22.4	20.9	12.2
Maximum temperature average (°C)	31.2	32.7	32.6	33.3	31.3	23.2
Average temperature (°C)	2.8	27.1	28.3	27.9	26.1	16.7
Average rainfall (mm)	28	2.5	11.3	17.9	66.8	24.6

2.2. Harvesting process

The Maturity date of seeds was altered from late October to late November regard to sowing dates. Seeds harvested when the pods were completely brown and seed moisture content about 14% at $1m^2$ form each replication and quintals per hectare. Followed, random selection of seeds (200g) was laid out for further germination and seedling growth tests from each replication.

2.3. Seedling growth tests

Wild Okra seedling growth tests were done for each sowing date treatment in four replications. The test was performed by BP (between paper) method for 7 days at 25C in incubator. It used 25 seeds in each replication. Everyday incubator temperature was checked. After 7 days duration, germination percentage, normal and abnormal seedlings percentage, radicle and hypocotyl length was determined.

2.4. Statistical analysis

After data determination, the statistical analyses to determine effects of different sowing dates on seeds quality, data analysis conducted by SAS computer program (Soltani, 2006). Statistical significance was declared at $P\leq0.05$ and $P\leq0.01$. Treatment effects from the two runs of experiments followed a similar trend, and thus the data from the two independent runs were combined in the analysis. Mean comparison was performed by LSD method.

3. Results and discussion

3.1. Analysis of variance

Results of analysis of variance showed that, effect of sowing date treatment was significant on harvested seeds vigor, so that sowing date treatment was significant on normal seedling percentage, abnormal seedling percentage, non-geminated seeds percentage and radicle and hypocotyl length ($P\leq0.01$) (Table2).

3.2. Mean comparisons

3.2.1. Effect of sowing date on normal seedling percentage

Mean comparison results for effect of sowing date on normal seedling percentage of wild okra showed that sowing date had significant effect on normal seedling, so that minimum normal seedling (83.33%) was obtained in May-5 sowing date treatment and maximum normal seedling (at least 87%) was recorded in Jun-5, Jul-11 and Agu-6 sowing dates and their differences were not significant (Table 3).

Table 2
Analysis of variance (mean square) of germination and seedling growth in wild okra seeds under different sowing dates.

S.O.V	df	Normal seedling	Abnormal seedling	Non-germinated seeds	Hypocotyl length	Radicle length
Sowing date	3	27.77*	27.71*	18.73*	0.78*	0.57**
Error	8	4.16	14.54	14.54	0.13	0.03
CV (%)		2.35	3.82	1.31	0.91	0.93

Ns,** and* not-significant, significant at 1% and 5% level respectively.

Table 3
Mean square of germination and seedling growth in wild okra seeds under different sowing dates.

Treatments	Normal seedling (%)	Abnormal seedling (%)	Non-germinated seeds	Hypocotyl length (cm)	Radicle length (cm)
May-5	88.33^{a}	6.66^{b}	5.00^{a}	3.70^{b}	2.17^{a}
Jun-5	87.00^{a}	8.66^{b}	4.44^{a}	3.59^{b}	2.07^{a}
Jul-11	90.00^{a}	8.33^{b}	1.66^{b}	4.72^{a}	2.48^{a}
Agu-6	83.33^{b}	13.33^{a}	3.33^{a}	4.00^{b}	1.43^{c}

Means by the uncommon letter in each column are significantly different ($p<0.05$).

3.2.2. Effect of sowing date on abnormal seedling percentage

Minimum abnormal seedling was obtained in three May-5, Jun-5 and Jul-11 sowing dates as 8.66% but Agu-6 sowing date increased abnormal seedling percentage until 13.33% (Table 3).

3.2.3. Effect of sowing date on non-germinated seeds percentage

Minimum non-germinated seeds were recorded in Jul-11 sowing date (1.66%), but in three May-5, Jun-5 and Agu-6 sowing dates maximum non-germinated seeds were 3.33% and their differences were not significant (Table 3).

3.2.4. Effect of sowing date on hypocotyl length

Seeds of Jul-11 sowing date treatment had the highest hypocotyl length (4.72 cm) and in May-5, Jun-5 and Agu-6 sowing date treatments May-5, Jun-5, and Agu-6 was 4 cm or below (Table 3).

3.2.5. Effect of sowing date on radicle length

Results of effect of sowing date on radicle length showed that Jul-11 sowing date treatment had the highest radicle length (2.5 cm), but minimum radicle length was recorded in Agu-6 sowing date treatment (1.43 cm) and radicle length in tow other sowing such as May-5, Jun-5 dates was 2.1 cm (Table 3).

3.3. Simple correlation between traits

Results showed that correlation between radicle length and normal seedling percentage was positive (r=0.72). In other words, in each sowing date, with increasing of normal seedling percentage, radicle length was increased. Correlation of hypocotyl and radicle length with abnormal seedling percentage was negative. This means is increasing of abnormal seedling percentage laid to produce of shorter hypocotyl and radicle length in these seeds (Table 4).

Table 4
Simple correlation between germination and seedling growth traits in wild okra.

	Normal seedling	Abnormal seedling	non-Germinated seeds	Hypocotyl length	Radicle length
Normal seedling	1				
Abnormal seedling	-0.32ns	1			
Non-germinated seeds	-0.05ns	0.404ns	1		
Hypocotyl length	-0.24ns	-0.672*	-0.234ns	1	
Radicle length	0.72**	-0.686*	-0.249ns	0.34ns	1

Ns,** and* not-significant, significant at 1% and 5% level respectively.

The results of the present study showed that seeds that sowed in Jul 11 sowing date had the best quality as germination and seedling growth parameters. The present findings are in close conformity with previous workers (Huda and Samiruddin, 1987; Moniruzzamam et al., 2007) who recommended that mid-February to mid-March is the best time for quality seed production of okra under Bangladesh condition which is very similar to our agro-climatic condition. However, Seddique et al. (2002) showed that flax seeds that sown in either 16th February or 1st March produced the best quality seed, whereas 16th April and 1st May sowings produced inferior seed. They told that higher germination percentage and seed vigour index was recorded from 16th February and 1st March sowing because the matured pods faced less amount of rainfall during their harvesting period, resulting to more production of bold seeded pods at that time. This leads to suffocation, resulting to delayed as well as weak seedling growth as observed by Heydecker (1977).

In the present study maximum normal seedling was recorded in Jun 5, Jul 11 and Agu 6 sowing dates. However, in this study delaying sowing was associated with lower normal seedling that lead to increasing of abnormal seedling production. Delayed sowing influenced on grain filling and changes in the biochemical composition of seeds and shorter duration of the seed filling periods. However, seed germination ability was generally lower as sowing was delayed and was significantly lower in the last sowing. Minimum non-germinated seeds were recorded in Jul-11 sowing date and minimum non-germinated seeds were recorded in three May-5, Jun-5 and Agu-6 sowing dates. Seddique et al. (2002) told that sowing date had a small effect on seed viability, but a much effect on seed vigor. They also told that, when exposed to stress, then differences in vigor became apparent.

Weak emergence in the present study is due to radicle and hypocotyl length. The highest radicle length, but minimum radicle length was recorded in Agu-6 sowing date treatment. Highest seed vigor produced longer radicle and hypocotyl length and result to highest seedling emergence in the field as final result. Mid sowing date had best date for achieved to highest emergence and produce of normal seedlings. There was evidence that seed vigor was highest with intermediate sowing dates. The lower vigor of later sowing date of seeds may be partly due to lower seed weight (Haskins and Gorz, 1975). The changes in nutrition compositions in the second factor that effect on seed germination ability and seedling emergence and further establishment in the field. For example, Seddique et al. (2002) reviled that low protein percentage was found in earlier sowing and high protein percentage in the last sowing, which also had lowest seed vigor. They told that low seed vigor was not due to variation in water soluble carbohydrate, as it was similar in all sowing dates. Saeid and Rowland (1999) showed that high oil concentration is associated with low seed vigor in linseeds. However, in the present study not determined chemical compositions but, there are many documents that showed significant effects of these compositions on seed vigor and further seedling emergence and establishment (Saeid and Rowland, 1999). Furthermore, differences in seed nutrients content between different sowing dates did not account for the observed between sowing dates and overall later sowing dates associated with a shorter seed filling period, which was reflected in lower seed weight and the chemical compositions was largely unaffected.

Results of the present study showed that correlation between radicle length and normal seedling percentage was positive. However, the correlation of hypocotyl and radicle length with abnormal seedling percentage was negative. These results showed that there were significant correlations between seed germination and seedling emergence in all sowing dates. These results are in agreement with the results of Bekendam et al. (1987). They

concluded that for small seed species the germination capability of seed lots had a good correlation with their field emergence both under favorable and unfavorable field conditions. However, earlier sowing dates lead to the longer seed filling period and longer sunshine during the seed filling period. The final results of the present study showed that best sowing date was Jul-11 because of highest normal seedling production, lowest non-germinated seeds and longer hypocotyl and radicle length on Gorgan environmental condition.

4. Conclusion

In final, the results showed that when the aim of wild okra cultivation was seed producing at Gorgan, Golestan province, sowing date had the significant effect on seed harvesting quality, so that harvested seeds at Jul-11 sowing date treatment had the highest normal seedling, highest radicle and hypocotyl length and minimum non-germinated seeds, had highest quality. Harvested seeds in both two May-5 and Jun-5 sowing dates had been the nearly same qualities with seeds harvested at Jul-11 sowing date due to produce of normal and abnormal seedling percentage and radicle and hypocotyl length same to this sowing date (differences were not significant). Harvested seeds in Agu-6 sowing date treatment produced minimum normal seedling, maximum abnormal seedling and shorter radicle and hypocotyl length that had the lowest seed quality. In final, the results of the present study showed that can achieve to high quality harvested seeds in May-5 until Jul-11 sowing date in Gorgan environmental condition. Also, for exact proposal in this case need to more investigations.

References

Ali, S.M.M., Haque, M.M., Siddique, A.B., Alom, A.T.M.M., Mostofa, M.G., 2004. Effect of sowing date on the viability and vigour of tossa jute (*Corchorusolitorius* L.) seed in late sown condition. SAARC J. Agr., 2, 23-38.

Amlak, T.A.G., 1983. Influence of environment on seed production of *Avena sativa* and *Linumusitatissium*. Ph.D thesis. University of Wales. Bangor. UK.

Antia, B.S., Akpan, E.J., Okon, P.A., Umoren, I.U., 2006. Nutritive and anti-nutritive evaluation of sweet potatoes (*Ipomoea batatas* L.) leaves. Pak. J. Nutr., 5, 166-168.

Bekendam, J., Kraak, H.L., Vos, J., 1987. Studies on field emergence and vigor of onion, sugar beet, flax and maize seed. Acta. Horticult., 215, 83-95.

Blum, A., Punel, Y., 1990. Physiology attributes associated with drought resistance in a Mediterranian environment. Aust. J. Agr. Sci., 41, 799-810.

Duke, J., 1983. Handbook of energy crops. Published only on the internet, excellent information on a wide range of plants. 264.

Ghorbani, M.H., Soltani, A., Galeshi, S., Zeinali, I., 2002. Effect of mother induced salinity stress on germination and seedling growth and germination percentage and rate from produced sees under another saline stress on seeds. The 7th National Iranian Agronomy and Plant Breeding Congress. Karaj, Iran. 588.

Ghorbani, M.H., Zeinali, I., Rahkan, R., 2013. Evaluation of Wilk Okra (*Corchorusolitorius*) cultivation probability in Gorgan environmental condition. Research project report. Gorgan University of Agricultural Science and Natural Resources. 20.

Grubben, G.J., Denton, O.A., 2004. Plant resources of tropical Africans vegetables. 670.

Harper, J.L., Obeid, M., 1967. Influence of seed size and depth of sowing on the establishment and growth of varieties of fibre and oil seed flax. Crop. Sci., 7, 527-532.

Hossain, M.A., Mannan, S.A., Sultana, K., Khandakar, A.L., 1994. Survey on the constraints of quality jute seed at farm level. Agril. Support Service Project (GOB/WORLDBANK/ODA). Dhaka, Bangladesh.

Hskins, F.A., Gorz, H.J., 1975. Influence of seed size, planting depth and companion crop on emergence and vigor of seedling in sweet clover. Agron. J., 67, 652-654.

Mahbubul, I., Lzaz, M., Narais, A., Maksuder, R., 2002. Seed viability and vigour test in Jute (Corchorus ssp.). Pak. J. Agron., 44-46.

Makinde, S.C.O., Macarthy, A.P., 2006. Effects of intraspecific competition on some agronomic attributes of Celosia argental (L) in a field trial. Biol. Environ. Sci. J. Trop., 3(3), 115-121.

Oomen, H.A.P.C., Grubben, H.G.H., 1978. Tropical leaf vegetables in human nutrition. Communication 69, Department of Agricultural. Research, Royal Tropical Institute, Amsterdam, Netherlands. Orphan Publishing Co., Willemstad, Curacao.

Palada, M.C., Chang, L.C., 2003. Suggested Cultural Practices for Jute Mallow. International Cooperator Guide. 2(14), 1-4.

Palada, M.C., Crossman, S.M.A., 1998. Planting density affects growth and yield of bush okra. Proc. Carib. Food. Crop. Soc., 34, 52-57.

Porta, 2011. http://database.prota.org/PROTAhtml/Corchorus%20olitorius _En.htm

Saeid, I.G., Rowland, G.G., 1999. Seed colour and linolenic acid effects on agronomic traits in flax. Can. J. Plant. Sci., 79, 521-526.

Safahani, A., Kamkar, B., Zand, E., Bagherani, N., Bagheri, M., 2008. Reaction of grain yield and its components of canola (*Brassica napus* L.) cultivars in competition with wild mustard (*Sinapisarvensis* L.) in Gorgan. Iran. J. Crop. Sci., 9, 356-370.

SAS Institute, 1989. SAS users guide: Statistics. Version 6.03.SAS Inst., Cary, NC.

Seddique, A.B., Wright, D., Mahbub Ali, S.M., 2002. Effects of time of sowing on the quality of Flax seed. Online. J. Biol. Sci., 2(8), 538-541.

Yalock, J.Y., 1980. Effect of plant population on pod kernel characteristics of varieties in Nigeria. Nig. J. Sci., 14(1&2), 265-278.

How to cite this article: Ghorbani, M.H., Pasandideh Tashakori, A., 2016. Effect of different sowing dates on Azivash (*Corchorusolitorius*) seed quality. International Journal of Advanced Biological and Biomedical Research, 4(3), 312-318.