J. Farm Sci., 31(2): (213-216) 2018

RESEARCH NOTE

Effect of season and plant growth regulators on seed yield and quality in Dolichos bean [*Lablab purpureus* L. (Sweet)]

PRAMODA AND ASHOK S. SAJJAN

Department of Seed Science and Technology
College of Agriculture
University of Agricultural Sciences
Dharwad – 580005, Karnataka, India
E-mail: pramodacool143@gmail.com

(Received: May, 2017 ; Accepted: June, 2018)

Field experiments were conducted in the Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad, Karnataka during 2016-17. The field experiment consisted of 18 treatment combinations involving two seasons *viz., kharif* 2016 and *rabi* 2016-17 and plant growth regulators *viz.,* G_1: Control, G_2 : GA_3@ 50ppm, G_3 : NAA @ 40ppm, G_4 : Cycocel @ 100ppm, G_5 : Mepiquat chloride @ 50 ppm, G_6 : Nitrobenzene @ 200ppm, G_7: TIBA @ 50ppm, G_8 : Brassinosteroids @ 200ppm, G_9: GA_3 @ 5ppm + IAA @ 5ppm and experiment was laid out in Factorial RBD with three replications. The higher seed quality parameters namely for test weight (24.31 g), germination (90.00 %), shoot length (23.62 cm), root length (23.61 cm), seedling vigour index I (4301), seedling dry weight (32.08 mg), lower EC (0.227 dS m^{-1}) and higher dehydrogenase enzyme activity (0.551) were obtained in the rabi season compared to *kharif* season. Higher seed quality parameters like test weight (25.00 g), germination (91.53 %), shoot length (25.99 cm), root length (25.21 cm), seedling vigour index I (4690), seedling dry weight (33.96 mg), lower EC (0.188 dS m^{-1}) and higher dehydrogenase enzyme activity (0.607) were recorded in NAA @ 40 ppm followed by Nitrobenzene @ 200 ppm. The interaction effect was found to be non-significant for majority of the characters studied. However, both the season plants sprayed with NAA @ 40 ppm recorded higher crop growth, seed yield and quality parameters compared control and other plant growth regulators sprayed.

Keywords: Dolichos bean, Nitrobenzene, Seed

Dolichos bean, *Lablab purpureus* L. (Sweet) is commonly known as field bean. belongs to the family fabaceae. It is a bushy, semi erect, perennial herb showing no tendency to climb. Dolichos bean is remarkably adaptable to wide areas under diverse climatic conditions such as arid, semi-arid, subtropical and humid regions where temperature vary between 22^0 C to 35^0, low-lands and uplands and many types of soils and the pH varying from 4.4 to 7.8.It is a drought tolerant crop and grows well in dry lands with limited rainfall. The crop prefers relatively cool seasons with temperature ranging from 14^0 to 28^0 C. Its wild forms are found in India. Lablab is a Dolichos bean mostly confined to the peninsular region and cultivated to a large extent in Karnataka and adjoining districts of Tamil Nadu, Andra Pradesh and Maharashtra. Karnataka contributes a major share, nearly 90 percent in terms of both area and production in the country. Karnataka state records production about 18,000 tonnes from an area of about 85,000 hectares (Anon., 2015). Non-availability of quality seeds, absence of suitable seed production technology, heavy flower dropping and heavy incidence of pest and diseases, inadequate post harvest handling operations and lack of knowledge about varieties by farmers lead to fall in productivity. It could be enhanced by developing suitable low cost seed production technology by combining conventional and scientific practices for achieving the commercial success of the crop. In contrast to the breeding approach which is difficult and costly, foliar application of plant growth regulators is an easy, low cost and low risk technique and alternative approach to overcome agricultural problems. The plant growth regulators applied as foliar spray at proper crop growth stage at optimum concentration play a significant role in increasing seed yield and quality in different field crops (Nagasubramaniam *et al.,* 2007). It is considered as the influence of economic factors on the future of growth regulators in relation to their use in field crops. Keeping this background in view, the present investigation was initiated with an objective to enhance the productivity of this crop by use of plant growth regulators.

The *kharif* field experiment was conducted at the Main Agricultural Research Station Farm, University of Agricultural Sciences, Dharwad during 2016 while the *rabi* field experiment in the Saidapur Farm in 2016-17and laboratory studies at Seed Unit Dharwad and in the laboratory of Seed Science and Technology, University of Agricultural Sciences, Dharwad. It is situated under the Agro Climatic Zone-8 (Northern Transitional tract) of Karnataka State the Agro Climatic Zone-8 (Northern Transitional tract) of Karnataka State. The soil of the experimental site was medium deep black clay. The experiment comprised of two seasons as one factor and plant growth regulators as other factor with 18 treatment combination. The experiment was laid out in two factorial RCBD design with three replications. The seeds dibbled at 45 x 15 cm spacing and entire quantity of fertilizer 25:50:25 kg NPK per ha was applied as a basal dose. Routine cultural operations were attended to keep the plots free from weeds. Harvested seed subjected to laboratory studies. The observations on seed quality parameters *viz.,* test weight (g), seed germination (%), shoot length (cm), root length (cm), seedling dry weight (mg), dehydrogenase enzyme (OD value) and electrical conductivity of seed leachate (dS m^{-1}) were recorded apart from seed yield and its components. Seedling Vigour index was computed by seed germination (%) and Seedling dry weight in mg.

In the present study significant differences were observed between the seasons and foliar spray of growth regulators. The *rabi* season crop recorded 2.80 per cent increased seed yield per hectare (1,281 kg) as compared to the *kharif* season (1,246 kg) and the plant growth regulators the 14.96 per cent increased seed yield (1,360 kg) due to foliar spray of growth regulator NAA @ 40 ppm was recorded followed by nitrobenzene @ 200 ppm. The interactions due to seasons and foliar spray of growth regulators are found to be non significant. However higher seed yield 1,375 kg per ha produced by *rabi* season and NAA @ 40 ppm. Similar seasonal differences in

Table 1. Effect of season and plant growth regulators on seed yield and quality parameters in dolichos bean

Treatments	Seed yield (kg/ha)	Test weight (g)	Seed germination (%)	Seedling length (cm)
Season (S)				
S_1-*kharif*-2016	1,246	24.07	89.28(71.03)*	45.42
S_2-*Rabi*-2016-17	1,281	24.31	90.00 (72.77)	47.23
S.Em±	8.0	0.21	0.590 (0.589)	0.20
C.D. at 1%	24	NS	1.695 (1.693)	NS
G_1: Control	1,183	23.51	86.93 (68.87)*	39.42
G_2 : GA_3 @ 50 ppm	1,276	23.81	90.47 (72.21)	46.82
G_3 : NAA @ 40 ppm	1,360	25.00	91.53 (72.96)	51.20
G_4 : Cycocel @ 100 ppm	1,252	23.74	88.99 (71.57)	47.07
G_5 : Mepiquat chloride @ 50 ppm	1,268	24.10	90.13 (71.90)	45.23
G_6 : Nitrobenzene @ 200 ppm	1,299	24.75	90.50 (72.31)	49.05
G_7 : TIBA @ 50 ppm	1,197	23.61	90.07 (71.75)	44.89
G_8 : Brassinosteroids @ 200 ppm	1,252	23.78	89.88 (73.39)	45.18
G_9 : GA_3 @ 5 ppm + IAA @ 5 ppm	1,280	24.32	90.48 (72.13)	48.01
S.Em±	17.0	0.44	1.251 (1.249)	0.41
C.D.	C.D. at 5%	C. D. at 1%	C. D. at 1%	C. D. at 1%
	48	1.27	3.596 (3.591)	1.26
Interactions				
S_1G_1	1,158	23.99	86.33(68.37)*	38.52
S_1G_2	1,256	23.32	89.30(70.91)	46.45
S_1G_3	1,344	25.20	90.30(72.12)	47.75
S_1G_4	1,226	24.39	90.13(71.75)	46.40
S_1G_5	1,255	23.86	88.33(70.06)	44.51
S_1G_6	1,290	25.06	89.00(70.77)	47.58
S_1G_7	1,179	23.73	90.34(72.10)	44.61
S_1G_8	1,242	24.16	90.25(71.99)	43.95
S_1G_9	1,260	24.87	89.56(71.23)	48.93
S_2G_1	1,209	23.75	87.53(69.37)	40.31
S_2G_2	1,296	23.56	91.66(73.51)	47.85
S_2G_3	1,375	25.40	92.93(74.79)	51.91
S_2G_4	1,277	24.07	89.66(71.40)	47.74
S_2G_5	1,281	23.98	91.93(73.74)	45.95
S_2G_6	1,308	24.91	92.00(73.85)	50.52
S_2G_7	1,216	23.67	89.88(71.40)	45.17
S_2G_8	1,261	23.97	91.40(73.03)	46.43
S_2G_9	1,301	24.60	91.40(73.03)	49.16
Mean	1,262	24.19	90.13 (71.90)	46.32
S.Em±	23	0.63	1.770 (1.767)	0.59
C.D. at 1%	NS	NS	NS	NS

NS - Non-significant * Arc sine root transformed values

chick pea with respect to plant growth have been reported by Merwade (2000) and Bulla (2009) in chick pea and on seed yield and yield attributes by Reddy (2005) in cow pea. The NAA treatment has showed stimulatory influence with growth parameters over control and other growth regulators. These findings are in conformity in other crops like chickpea (Reddy, 2005).

The seed quality parameters were reported to vary between season and environmental factors. The seed produced during *rabi* season recorded higher seed germination (90.00 %) as compared to *kharif* season (89.28 %). The higher seed germination may be attributed to better test weight (24.31 g), seedling length (47.23 cm) (Table 1 and 2). seedling dry weight (32.08 mg), seedling vigour index-I (4301) and higher dehydrogenase enzyme activity (0.551) and lower electrical conductivity of seed leachate (0.227 dS m^{-1}) as compared to *kharif* season (S_1) (Table 2). The *kharif* season yielded poor quality seeds with higher electrical conductivity values due to inferior crop growth and reproductive performance in view of the prevalence of adverse weather conditions. Similar variable effects of different sowing seasons on seed quality parameters were also reported by Solanki and Gupta (2000) revealed that higher number of branches per plant, number of capsules per plant, seed yield per plant, test weight (g) and seed yield (q/ha) was recorded in S-5 (37.7, 3.32, 3.04 and 5.17) followed by HT-16 (34.2, 2.92, 2.71) and least values were recorded from TC-25 (32.5, 2.54, 2.60 and 3.87) genotypes of sesame grown in *kharif* season.

It is an established fact that seed quality attributes were reported to vary among the plant growth regulators. In the

Table 2. Effect of season and plant growth regulators on seed quality parameters in dolichos bean

Treatments	Seedling vigour index I	Seedling dry weight (mg)	Dehydrogenase enzyme (OD value)	Electrical conductivity of seed leachate (dS m^{-1})
Season (S)				
S_1-*Kharif*-2016	4,056	31.02	0.499	0.236
S_2-*Rabi*-2016-17	4,301	32.08	0.551	0.227
S.Em±	10	0.13	0.004	0.003
C.D. at 1%	29	0.38	0.011	NS
Plant Growth regulators (G)				
G_1: Control	3,427	29.85	0.446	0.290
G_2 : GA_3 @ 50 ppm	4,265	31.64	0.478	0.247
G_3 : NAA @ 40 ppm	4,686	33.96	0.607	0.188
G_4 : Cycocel @ 100 ppm	4,188	30.61	0.471	0.253
G_5 : Mepiquat chloride @ 50 ppm	4,076	31.51	0.471	0.236
G_6 : Nitrobenzene @ 200 ppm	4,439	32.78	0.569	0.199
G_7 : TIBA @ 50 ppm	4,043	29.63	0.476	0.219
G_8 : Brassinosteroids @ 200 ppm	4,088	31.92	0.475	0.252
G_9 : GA_3 @ 5 ppm + IAA @ 5 ppm	4,344	32.06	0.554	0.200
S.Em±	21	0.28	0.008	0.006
C.D. at 1%	61	0.81	0.022	0.018
Interactions S × G				
S_1G_1	3,325	29.68	0.438	0.301
S_1G_2	4,148	31.16	0.475	0.249
S_1G_3	4,311	33.10	0.594	0.191
S_1G_4	4,182	30.12	0.467	0.260
S_1G_5	3,931	30.89	0.643	0.238
S_1G_6	4,234	32.10	0.564	0.197
S_1G_7	4,030	29.14	0.471	0.228
S_1G_8	3,936	31.17	0.473	0.254
S_1G_9	4,382	31.78	0.546	0.204
S_2G_1	3,528	30.02	0.453	0.279
S_2G_2	4,385	32.12	0.482	0.244
S_2G_3	4,824	34.82	0.619	0.184
S_2G_4	4,279	31.10	0.475	0.246
S_2G_5	4,224	32.12	0.479	0.234
S_2G_6	4,645	33.45	0.573	0.201
S_2G_7	4,059	30.12	0.481	0.210
S_2G_8	4,243	32.67	0.478	0.250
S_2G_9	4,494	32.34	0.561	0.196
Mean	4,179	31.55	0.505	0.231
S.Em ±	30	0.40	0.011	0.009
C.D. at 1%	87	NS	NS	NS

NS - Non-significant

present investigation, all the seed quality parameters were found to differ among the plant growth regulators irrespective of season. The seed quality parameters namely for test weight (25.00 g), seed germination (91.53 %), seedling length (51.20 cm) (Table 1) seedling dry weight (33.96 mg) seedling vigour index-I (4686) and higher dehydrogenase enzyme activity (0.607) and lower electrical conductivity of seed leachate (0.188 dS m^{-1}) (Table 2), were recorded with foliar spray of NAA @ 40 ppm, this was followed by nitrobenzene @ 200 ppm foliar spray. These plant growth regulators are known to increase sink and source relationship due to enhanced translocation of assimilates towards the sink (seeds) leading to more number of well developed, matured pods per plant with higher test weight and germination performance The present findings are in conformity with the findings of Tonapi and Kulkarni, (1986). in cow pea. The significant increase in seed quality parameters due to growth regulators might be attributed to increased source and sink relationship and efficient translocation of assimilates towards the developing sinks (seeds) causing greater accumulation of food reserves in seeds leading to higher seed test weight and germination percentage apart from enhanced biochemical and metabolic processes. Similar beneficial effects of growth regulators on seed quality traits were also reported by Lakshmamma and Rao (1996) recorded significantly higher plant height in black gram due to foliar application of 20 ppm NAA at 50 per cent flowering and subsequently one week later.

It is an established fact that seed quality attributes were reported to vary due to the plant growth regulators. In the present investigation, all the seed quality parameters did not differ significantly due to plant growth regulators and season. The seed quality parameters namely test weight (25.40 g), seed germination (92.93 %), seedling length (51.91 cm) (Table 1), seedling dry weight (34.82 mg), seedling vigour index-I (4824), higher dehydrogenase enzyme activity (0.619) and lower electrical conductivity of seed leachate (0.184 dS m^{-1}) (Table 2) recorded in S_2G_3 followed by S_1G_3. These finding are similar with results of Patil *et al.* (2011) reported that in gram plant height was increased maximum by treatment nitrobenzene (20 %) and minimum in control. The days to 50 % flowering maximum and no. of pods per plant showed significant results by the treatment of nitrobenzene (20 %) over all treatments, nitrobenzene (20 %) showed statistically significant results over all treatments *i.e.,* 17.49 q/ha in the year 2009-2010 and 12.68 q/ha in the year 2010-2011.

From the present studies on effect of season and plant growth regulators on seed yield and quality parameters in Dolichos bean [*Lablab purpureus* (L.) Sweet] revealed that the superiority of Dolichos bean cv. HA-4 crop grown in *rabi* season produced higher seed yield and better quality seeds than the *kharif* season. Dolichos bean crop cv. HA-4 crop grown in *rabi* season sprayed with NAA @ 40 ppm and recorded mgh seed quality such as test weight and germination per cent it was followed by foliar spray of nitrobenzene @ 200 ppm andGA_3 @ 5ppm + IAA @ 5 ppm as compared to the control.

References

Anonymous, 2015, www. Lablab.org

Bulla, G., 2009, Seed Technological studies in chick pea varieties (*Cicer arietinum* L.). *Ph.D. Thesis,* Univ. Agric. Sci., Dharwad (India).

Lakshmamma, P. and Rao, I. V. S., 1996, Influence of shading and naphthalene acetic acid (NAA) on yield components in blackgram (*Vigna mungo* L.). *Ann. Agric. Res.,* 17 (3): 320-321.

Merwade, M. N., 2000, Investigation on seed production techniques and storability of bengal gram, *Ph.D. Thesis,* Univ. Agric. Sci., Dharwad, (India).

Nagasubramaniam, A., Pathmanabhan, G. and Mallika, V., 2007, Studies on improving production potential of baby corn with foliar spray of plant growth regulators. *Annuals Rev. Plant Physiol.,* 21: 154-157.

Parmar, V. K., Dudhatra, M. G. and Thesiya, N. M., 2012, Effect of growth regulators on yield of summer greengram. *Leg. Res.,* 34 (1): 65-67.

Patil, S. V., Gite, B. D. and Doiphode, G. S., 2011, Effect of various soil applied and foliar micronutrients on growth and yield of gram. *Universal Res. Analysis, Half yearly Res. J.,* 1(3): 1-4.

Reddy, P., 2005, Effect of growth retardants and nipping on growth and yield parameters in cow pea (*Vigna unguiculata* L.). *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad (India).

Solanki, Z. S. and Gupta, D., 2000, Genotype x environment interaction study for seed yield in sesame. *J. Oilseeds Res.,* 17 (1): 29-31.

Tonapi, V. A. and Kulkarni, G. N., 1986, Effect of foliar spray of maleic hydrazide on vigour index and field emergence of seeds of cultivars of vegetable cowpea (*Vigna unguiculata* L. Walp.). *South Indian Hort.,* 34 (5): 314-319.