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Effect of foliar spray of NAA (Naphthalene acetic acid) on seed quality of pigeonpea (*Cajanus cajan* (L.) Millsp.)

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Abstract
A field experiment was conducted at Experimental farm, Department of Agricultural Botany, VNMKV, Parbhani, during *kharif* 2020-21 to evaluate "Effect of foliar spray of NAA (Naphthalene acetic acid) on seed quality of pigeonpea (*Cajanus cajan* (L.) Millsp.)" Using variety BSMR-736. The experiment was laid out in randomized block design with eight treatments and three replications. The different treatments were foliar application of NAA of various concentrations *Viz.*, 10, 20, 30, 40, 50, 60, 70, 80 ppm along with one control. Spraying was done at flower initiation and 30 days after first spray. Observations on seed quality traits traits *viz*., germination %, root length, shoot length, vigour index and seed size were recorded after harvesting in laboratory. Considering various concentrations of NAA, T_8 (80 ppm NAA) was found more effective in in increasing seed quality traits when compared with all other treatments and control.

Keywords: pigeonpea, randomized block design, NAA, foliar spray, seed quality traits

Introduction
Pigeonpea is one of the most important pulse crop. It comes under family fabaceae with (2n=2x=22) diploid chromosome number. It is an often cross pollinated (20-70%) crop. Pigeonpea is an important source of high protein (20-22%) under food legumes. Pigeonpea is also the economical source of proteins, carbohydrates, minerals and vitamins such as B-complex particularly in the vegetarian diet. Seeds of arhar are also rich in iodine and iron. It is most commonly consumed as dal.

High flower drop and pod drop in pigeonpea result in low yield of pigeonpea due to poor pod set. With the use of growth regulators significantly enhance yield attributing and seed quality parameters. Seed quality is one of the most essential factor in crop production. Initial quality of seed can lead to increase in the crop yield as it can regulate growth and development of future crop. Foliar spray of auxins like NAA (Napththalene acetic acid) increases the yield attributing and seed quality parameters in pigeonpea.

Materials and Methods
A field experiment was conducted at Experimental farm, Department of Agricultural Botany, VNMKV, Parbhani, during *kharif* 2020-21 to evaluate "Effect of foliar spray of NAA (Naphthalene acetic acid) on seed quality traits of pigeonpea (*Cajanus cajan* (L.) Millsp.)" using variety BSMR-736. The experiment was laid out in randomized block design with eight treatments and three replications. Gross plot size was 5.4 m x 5.5 m. Seeds were sown at the rate of 10 kg ha^{-1} by dibbling method at a spacing of 120 cm x 120 cm on 15th July 2020. Treatments comprised of T_0 (control). T_1 (10 ppm NAA), T_2 (20 ppm NAA), T_3 (30 ppm NAA), T_4 (40 ppm NAA), T_5 (50 ppm NAA), T_6 (60 ppm NAA), T_7 (70 ppm NAA) T_8 (80 ppm NAA) along with one control. Foliar application of NAA was done at two stages i. e. at flower initiation and at 30 days after first spray. Seed quality parameters *viz*., germination %, root length, shoot length, vigour index and seed size were recorded after harvesting. Seed quality parameters were estimated in laboratory by adopting between paper methods. From each treatment, 100 seeds were randomly placed on the moist towel paper in three replications. Then paper is rolled properly and placed in seed germinator at constant temperature (25^0) and relative humidity (80%). On the day of first (4th) and final count (9th) germination % was recorded, on the day of final count (9th) root length and shoot length were recorded using metric scale, seedling vigour index was done using formula given by ISTA and seed size was

Computed using a seed size measuring instrument available in seed tool kit.

Results and Discussion

Germination %

Data pertaining to seed germination percentage is presented in the table 1. Significant and maximum germination % was recorded in treatment T_8 (80 ppm NAA) 97.67 %, followed by treatment T_7 (70 ppm NAA) 95.67 % and treatment T_6 (60 ppm NAA) 94 % when compared with rest of the treatments and control. The results are in accordance with those reported by Hilli *et al*. (2008) and recorded that NAA 50 ppm recorded significantly highest germination percentage in ridge gourd, Khan *et al*. (2013) [3] recorded that there was significant increase in germination percentage with use of NAA @ 100 ppm in okra, Arvind kumar *et al*. (2014) [1] reported that NAA at 50 mg/l showed maximum germination percentage in bitter gourd, Kumbari (2002) [4] revealed that NAA 100 ppm showed maximum germination percentage in tomato.

Root length (cm)

Data related to root length is represented in table 1. Significant and maximum root length was recorded in treatment T_8 (80 ppm NAA) 19.85 followed by treatment T_7 (70 ppm NAA) 19.64 and treatment T_6 (60 ppm NAA) 19.53 when compared to rest of the treatments and control. The results are in accordance with those reported by Kumbari (2002) [4] and revealed that NAA 100 ppm showed maximum root length in tomato. Singh *et al*. (2017) [5] reported that NAA @ 50 ppm resulted in increase in seedling length.

Shoot length (cm)

Data related to shoot length is represented in table 1. Significant and maximum shoot length was recorded in treatment T_8 (80 ppm NAA) 24.29 followed by treatment T_7 (70 ppm NAA) 24.17 and treatment T_6 (60 ppm NAA) 23.92 when compared to rest of the treatments and control. Similar findings was observed by Kumbari (2002) [4] and revealed that NAA 100 ppm recorded maximum shoot length in tomato, Singh *et al*. (2017) [5] reported that NAA @ 50 ppm resulted in increase in seedling length.

Vigour index

Data related to vigour index is represented in table 1. Significant and maximum vigour index was recorded in treatment T_8 (80 ppm NAA) 4310.00, followed by treatment T_7 (70 ppm NAA) 4194.00 and treatment T_6 (60 ppm NAA) 4074.67 when compared to rest of the treatments and control. Similar findings was observed by Hilli *et al.* (2008) revealed that NAA 50 ppm recorded significantly highest vigour index in ridge gourd, Kumbari (2002) [4] revealed that NAA 100 ppm recorded maximum vigour index in tomato, Therakam (2001) recorded that among various concentrations of NAA under his study highest vigour index was observed with foliar application of NAA @ 20 ppm in brinjal.

Seed size (mm)

Data related to seed size is represented in table 1. Significant and maximum seed size was recorded in treatment T_8 (80 ppm NAA) 5.53, followed by treatment T_7 (70 ppm NAA) 5.45 and treatment T_6 (60 ppm NAA) 5.37 when compared to rest of the treatments and control.

Table 1: Effect of NAA on seed quality traits

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index	Seed size (mm)
T_0 (Control)	81.33	15.32	21.52	2995.67	4.97
T_1 (10 ppm NAA)	83.33	16.09	21.52	3134.33	5.04
T_2 (20 ppm NAA)	86.67	16.82	21.73	3341.33	5.07
T_3 (30 ppm NAA)	87.67	17.77	23.74	3638.67	5.13
T_4 (40 ppm NAA)	89.00	18.56	23.78	3766.67	5.23
T_5 (50 ppm NAA)	91.00	19.09	23.80	3903.33	5.27
T_6 (60 ppm NAA)	94.00	19.53	23.92	4704.67	5.37
T_7 (70 ppm NAA)	95.67	19.64	24.17	4194.00	5.45
T_8 (80 ppm NAA)	97.67	19.85	24.29	4310.00	5.53
SE (m)±	0.78	0.02	0.04	32.11	0.02
CD at 5%	2.37	0.05	0.13	97.08	0.06

Conclusion

Among all the treatments, treatment T_8 (80 ppm NAA) was found significantly superior in germination %, root length, shoot length, vigour index and seed size when compared to rest of the treatments and control.

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