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STUDIES ON CHEMICAL REGULATION OF VIGOUR INDEX, MORPHO-PHYSIOLOGICAL AND QUANTITATIVE CHARACTERS BY SEED TREATMENT IN MUNGBEAN (*Vigna radiata* (L.) WILCZEK)

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ABSTRACT

An experiment was conducted during Kharif season 2012-13 at the research farm and research laboratory of Institute of Agricultural sciences, Singhaniya University, Jhunjhunu, Rajasthan, to find out the effect of different levels of growth regulator on germination percent and seed vigour and other characters of Pant mung-5, K-851 and Pusa-9072 varieties of Vigna radiata L. The different levels of growth regulators viz., Tap water, IBA 100ppm and GA3 100ppm, gave significantly higher seed germination percent and vigour percent over control. Almost similar results were obtained in case of germination percent, shoot length, root length, seedling dry weight, vigour index, chlorophyll-a, chlorophyll-b and proline content. The application of growth regulator GA3100ppm in variety Garima was the best combination for getting higher germination percent and vigour with better seed growth.

Key Words : *Growth regulator, germination percent and seed vigour.*

India is the largest pulses producing nation in the world.Pulses are mainly grown in rainfed area. Mung bean (*Vigna radiata* L.) is considered as one of the most important pulse crop in India. It is important legume crop characterized by a relative high content of protein (22%) and short summer season crop. It is one of the important pulses crops cultivated in India ranking third having about 70% of the world area and 45% of production. In India area occupied by mung bean is about 3 million ha. with total production of 1.1 million tones but average productivity (3.20 q/ha) is quite low. Amongst the various application of optimum quantity of growth regulators has an important role in getting high germination and vigour percent in mung bean (1) under Rajasthan conditions no research work has been done to find out the proper doze of growth regulator application for getting high germination and vigour in mung bean keeping in view the above facts the present study was under taken to find out the effect of application of growth regulator on germination, vigour and other characters in different varieties of mung bean viz.- Pant mung-5, K-851 and Pusa-9072 in the Agro-climatic conditions of Jhunjhunnu region, Rajasthan.

MATERIALS AND METHODS

The field experiment and laboratory experiment was conducted at the Agricultural research farm and laboratory of Agriculture institute of Singhania university, Rajasthan during Kharif season, 2012-13. The treatments were comprised of four doses of growth regulators viz., tap water, IBA 100ppm and GA3 100ppm with control and three varieties of mung bean, viz., Pant mung-5, K-851 and Pusa-9072 and the experimental design used was factorial central randomized block with three replications. Urea was the source of nitrogen and the source of sulphur was gypsum while triple super-phosphate was used as source of phosphorus. Observations were recorded on germination and vigour, shoot length, root length, seed length dry weight, chlorophyll-a, chlorophyll-b and proline content. The subjected was to statistical analysis as per method proposed by (2).

RESULTS AND DISCUSSION

The results obtained in the present study are discussed characters-wise.

Germination percent : The results presented in Table-1 showed that priming with growth regulators

Table-1: Effect of growth regulators priming on seed germination, shoot length, root length, seedling dry weight and some other traits in Mung bean.

Treatments	Germination %	Mean	Shoot length (cm)	Mean	Root length (cm)	mean	Seedling dry weight (g)	mean
	Variety – Pant Mung-5							
T_0-Control	85.09	87.76	19.80	22.76	15.96	18.34	0.158	0.190
T_1-Tap water	91.09	92.74	22.06	24.72	17.38	18.99	0.172	0.221
T_2-IBA 100 ppm	96.33	96.55	23.15	25.33	17.48	21.05	0.200	0.243
T_3-GA_3 100 ppm	99.96	97.86	23.79	26.00	18.88	21.73	0.230	0.267
Mean	92.66		22.17		17.40		0.189	
CD at 5%	V=2.70		V=1.83		V=1.46		V=0.04	
Treatments	**Variety – K-851**							
T_0-Control	87.32	87.76	23.61	22.76	18.86	18.34	0.221	0.190
T_1-Tap water	96.08	92.74	26.08	24.72	18.88	18.99	0.280	0.221
T_2-IBA 100 ppm	100.0	96.55	26.38	25.33	22.06	21.05	0.291	0.243
T_3-GA_3 100 ppm	100.0	97.86	27.30	26.00	22.48	21.73	0.319	0.267
Mean	95.99		25.88		20.58		0.276	
CD at 5%	T=4.84		T=1.93		T=2.51		T=0.032	
Treatments	**Variety – Pusa-9072**							
T_0-Control	90.33	87.76	24.92	22.76	21.15	18.34	0.199	0.190
T_1-Tap water	90.01	92.74	26.13	24.72	21.80	18.99	0.214	0.221
T_2-IBA 100 ppm	93.13	96.55	27.45	25.33	24.60	21.05	0.238	0.243
T_3-GA_3 100 ppm	96.94	97.86	27.96	26.00	24.82	21.73	0.258	0.267
Mean	92.57		27.12		22.11		0.237	
CD at 5%	VxT=6.77		VxT=2.70		VxT=3.52		VxT=0.043	

viz., IBA and GA3 in 100ppm concentration for 04 h significantly improved the germination percent over tab water priming and untreated control. All the three varieties differed significantly from each other. The growth hormone GA_3 showed maximum germination (97.85) followed by IBA and tap water. These findings are in consonance with the reports of (3) among all the three varieties of mung bean increase in seed germination with all the doses of growth regulators against control. The highest seed germination was recorded in K-851 (100.0) followed by Pant mung-5 (99.96) and the lowest seed germination (96.94) were recorded in Pusa-9072. The germination percent of increase was higher with GA_3 followed by IBA and tap water. Similar findings were reported by (4) who reported that the growth regulator GA_3 gave highest seed germination as compared to other growth treatments.

Shoot length : Shoot length recorded in three varieties of mung bean viz., Pant mung-5, K-851 and Pusa-9072 and three doses of growth regulator over control are given in Table-1, which revealed that two varieties i.e. K-851 and Pusa-9072 gave significantly higher shoot length as compared to variety Pant mung-5. The highest shoot length (27.92) was recorded in mung bean variety Pusa-9072 in compared to K-851 and Pant mung-5 but the lowest shoot length (22.06) was recorded in case of variety, Pant mung-5. These findings are consonance with the reports of (4). In case of priming of seed with growth regulators, GA_3 priming was observed to be significantly better over control as well as other two doses (tap water and IBA 100ppm) of growth regulators in shoot length in mung bean. But the application growth regulator at the rate of IBA and tap water was also significantly differed with each other in producing shoot length. Similar results were reported by (3) who found the application of growth regulators in mung bean was beneficial as it increased the shoot length according to GA_3 priming, IBA and tap water.

Root length : It was revealed from Table-1 that all the three varieties of mung bean had significant effect on the root length. The highest root length was recorded (24.82 cm.) in Pusa-9072 variety. This was significantly higher in comparison to the root length in Pant mung-5 and K-851. However, non-significant difference was observed between the heights of plant length of Pant mung-5 and K-851. The effect of different doses of growth regulators on root length was evident from the

Table-2: Effect of varying levels of growth regulators priming on vigour index, chlorophyll-a, chlorophyll-b, proline content and some other traits in Mung bean.

Treatments	Vigour index	Mean	Chlorophyll -a (mg/lit.)	Mean	Chlorophyl l-b (mg/lit.)	Mean	Proline content	Mean
	Variety–Pant Mung-5							
T_0-Control	14.30	16.39	0.513	0.388	0.146	0.207	133	171.00
T_1-Tap water	14.70	18.58	0.593	0.471	0.158	0.311	142	180.66
T_2-IBA 100 ppm	19.99	23.11	0.852	0.605	0.277	0.463	176	228.01
T_3-GA3 100 ppm	21.58	23.99	0.808	0.577	0.240	0.392	249	268.66
Mean	18.35		0.71		0.199		172	
CD at 5%	-		V=0.261		V=0.133		V=68.09	
Treatments	**Variety–K-851**							
T_0-Control	21.22	16.39	0.223	0.388	0.232	0.207	290	171.00
T_1-Tap water	23.2	18.58	0.297	0.471	0.488	0.311	312	180.66
T_2-IBA 100 ppm	25.2	23.11	0.354	0.605	0.67	0.463	409	228.01
T_3-GA_3 100 ppm	25.4	23.99	0.317	0.577	0.549	0.392	455	268.66
Mean	24.75		0.296		0.484		363.51	
CD at 5%	-		T=0.11		T=0.11		T=44.6	
Treatments	**Variety–Pusa-9072**							
T_0-Control	14.63	16.39	0.48	0.388	0.255	0.207	94	171.00
T_1-Tap water	14.87	18.58	0.60	0.471	0.308	0.311	100	180.66
T_2-IBA 100 ppm	22.27	23.11	0.632	0.605	0.55	0.463	106	228.01
T_3-GA_3 100 ppm	26.98	23.99	0.611	0.577	0.389	0.392	114	268.66
Mean	18.96		0.559		0.346		100.26	

fact that the root length in different doses varied considerably. All the three doses of growth regulators (tap water, IBA 100ppm and GA_3 100ppm) had significantly high effect of root length in comparison to control this could be due to faster cell divisation and menstematic activity due to availability GA_3 and IBA mixture. These results are in agreement with the findings of (5) who reported that increasing levels of GA_3 priming increased the relative growth rate and asseveration rate at all the stages of crop growth.

Seedling dry weight : The results concerning seedling dry weight in three varieties of mung bean and growth regulators, presented in Table-1 reveled that maximum seedling dry weight (0.319 gm.) in plant was recorded in variety K-851, which was significantly superior in comparison to other two varieties, Pant mung-5 and Pusa-9072. The differenced in seedlings dry weight between Pant mung-5 and Pusa-9072 was significantly due to application of different doses of growth regulators viz.- tap water, IBA 100ppm and GA_3 100ppm, which produced higher seedling dry weight than control. The seedling dry weight recorded in three doses of growth regulators (Tap water, IBA 100 ppm and GA_3 100 ppm) was significantly different from each other and GA_3 priming gave highest dry seedling weight which was followed by tap water and IBA 100ppm. These results are in conformity with the findings of (5) who also reported increase in seedling dry weight with increase in doses of treatments.

Vigour index : The data given in Table-2 revealed that among all the three varieties of mung bean, variety Pusa-9072 gave significantly higher vigour index (26.98) as compared to Pant mung-5 and K-851, however, lowest vigour index (21.58) was recorded in variety Pant mung-5. The data also revealed that all the three doses of growth regulator gave significantly higher vigour index as compared to control. The use of GA_3 priming gave significantly higher vigour index (26.98) over other two doses i.e. tap water and IBA 100ppm. The differences in the vigour index between GA_3 100ppm, tap water and IBA 100ppm was non-significant. The value of vigour index in control was significantly low as compared to the vigour index value of all the other three doses of growth regulator. Similar result were reported by (6) who observed that vigour index, germination, seedling dry weight, increased significantly with increase in doses of treatments.

Chlorophyll-a content : Chlorophyll-a content of mungbean in three varieties i.e. Pant mung-5, K-851 and Pusa-9072 was significantly different among all the

varieties Table-2 variety Pant mung-5 had highest chlorophyll – a (0.852) followed by K-851 and Pusa-9072. Application of growth regulator, IBA 100ppm was significantly better over control and produced chlorophyll – a (0.852). However, chlorophyll – a recorded with the application of tap water and GA_3 100ppm remained at par. This significant influence of different doses of growth regulators over the lower levels may be because of prolonged formations. These results are in full agreement with those observed by (7), who observed that the increasing levels of growth regulator not only increased the chlorophyll–a but also gave higher chlorophyll–b, more prolin content, more leaf area index and higher net assimilation rate at all the stages of crop growth.

Chlorophyll–b content : It was observed that there was significant increase in chlorophyll-b with increase doses of growth regulator against control. All the three varieties differed significantly from each other. The highest chlorophyll–b Table-2 was recorded in K-851 (0.549) followed by Pusa-9072 (0.389) and the lowest chlorophyll-b (0.272) was recorded in Pant mung-5. These findings are in consonance with the reports of (7). In case of growth regulators, maximum chlorophyll–b (0.465) was recorded with the application of IBA 100ppm priming, which was significantly higher than all other three levels of growth regulator. Similar findings were reported by (8), who reported that treatment doses of IBA priming gave highest chlorophyll–b as compared to other treatments.

Proline content : The proline content is most important traits in mung bean seeds for obtained good grain yield is given in Table-2 indicated that proline content of different varieties was significantly different from each other. The highest proline content was recorded in variety K-851 followed by Pant mung-5 and Pusa-9072. However, significantly lower proline content was recorded in (94) in variety Pusa-9072 in comparison to K-851 and Pant mung-5 at both the stages. However, varieties K-851 and Pant mung-5 had most at par proline content study as (455 and 249) respectively. the differences in the mean value of proline content with the use of various levels of growth treatments were significantly higher in comparison to control (4). The highest proline content was recorded in GA_3 100 ppm followed by IBA 100 ppm and Tap water. These results conform the findings of (5), while going though the results obtained in this study of it was observed that proline content and proper application of growth treatments it is important attributes for getting high grain yield in mung bean.

CONCLUSION

The findings of present study clearly indicate role of proper varieties and growth treatments for getting higher germination and vigour index in mung bean K-851 followed by Pant mung-5 and Pusa-9072 gave better germination and vigour index in that order use of GA_3 100ppm give higher germination was the best than all other two levels of growth treatment for achieving better germination, growth, high vigour index, and better quality under Agro-ecological conditions of Jhunjhunu resations of Rajasthan.

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