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A Study on Effect of Gibberllic Acid on Seed Germination of Urad Bean

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A B S T R A C T

Plant growth regulators have a key role in regulating plant growth and development; especially the process of seed germination. Thus, the present investigation was carried to study the influence of Gibberllic acid in varied concentration on seed germination behavior. Different parameters like germination%, radicle and plumule length, fresh and dry weight etc were evaluated on two cultivars of urad bean. Both the varieties responded to treatments of Gibberllins but variations in the germination response were observed. Variety V2 showed overall better germination behavior than variety V1.

Introduction

Black gram or black eyed bean is commonly cultivated in southern Asia and had been grown in India since ancient times. Black gram has also been introduced to other tropical areas mainly by Indian immigrants. In India, the Guntur District ranks first in state Andhra Pradesh for the production of black gram. In state of Rajasthan these beans are cultivated throughout with major contribution coming from Jodhpur district. Seed germination and growth are two important physiological processes that occur in a seed. Superior seed germination and seedling growth promises good yield of crop plants. In vitro experiments using different plant growth regulators in varied concentration on pulse crops are carried with an objective to improve quality of species and enhance crop production. Thus, different plant growth promoting hormones have distinct role in germination process and growth of pulse crop plants.

The hormone involvement in the seed germination process is quite evident from hormone concentration correlation with specific development stages and also the correlation between the effects of applied hormones and their relationship to major metabolic activities. The Gibberllic acids also known as Gibberellins A3, GA3, and GA are a big family of diterpenoid and tetracyclic, plant growth regulators. Gibberllins play a major role in all growth processes like seed germination and development, stimulate fast stem and root growth, induce mitosis in the leaves, increase seed germination rate, the control of flowering time and even organ elongation (Yamaguchi, 2008). During germination process, Gibberellic acid kindles the cells of seeds to produce m-RNA molecules that code for specific hydrolytic enzymes. It is well documented that these are very powerful hormones which happen to occur naturally in plants and regulates their development in response to external

environment also (Chakrabarti and Mukherji, 2003). Their application in extremely low amount can have an intense effect whereas excess of it reverses the effect (Riley, 2012). They are also used in invitro studies to trigger seed germination in otherwise dormant seeds. In the light of above background, this study was undertaken to study the effect of Gibberllic acid on seedling germination and behavior on Urad bean. Keeping this in view, the following objectives were framed:

1.To find out the most advantageous concentration of Gibberllic acid to exercise them as an important factor in seed germination process of different pulse crops.

2.To study the response and seed quality parameters of the two varieties of urad bean.

Materials and Methods

In present study laboratory experiments were conducted by using two varieties of Urad bean and different concentrations of Plant growth hormone- Gibberllic Acid. The seeds were treated under different concentrations of 10, 50,100,300,500 ppm of GA with a separate control set for the two varieties. The seeds were pre-soaked for a day in the above mentioned concentrations and double distilled water was used for the control set. Two Seed varieties of urad bean were taken from the local distributor. Experimental details are as follows:
Pulse crop varieties used were:

V_1= T9
V_2= Shakti

Concentrations of Gibberllic Acid taken for treatments T in the study were:

T_1 – 0 % GA concentration (Control)
T_2 – 10 ppm of GA concentration
T_3 – 50 ppm of GA concentration
T_4 – 100 ppm of GA concentration
T_5 – 300 ppm of GA concentration
T_6 – 500 ppm of GA concentration

Four replicates of the treatments given were studied. Design of the experiment was CRD with factorial concept. Six seeds were placed on petri dish containing moist filter paper. First count of germination was taken on the very next day. After six days length of radicle, plumule, seedling, wet and dry weight were measured. Dry weight was also measured after its dispensation at 100^0c for 1 day. Recording of observations was done before and after germination accordingly for various parameters. Seed quality assessment was done by Germination test for %. The germination test was conducted using the paper towel method, by providing the optimum conditions for the test crop. The everyday germination counts were done for normal seedlings and total germination was calculated and expressed in percentage. For plumule length on the day of final count of the germination test, normal seedlings were selected from each treatment. The plumule length was measured from the base of primary leaf to base of hypocotyle and mean plumule length was expressed in centimetres. For radicle length, normal seedlings which were used for plumule length measurement were used only. Length was measured from the base of hypocotyle to the tip of primary root and mean radical length was expressed. By adding the plumule and radicle lengths of already selected normal seedlings the seedling length was calculated and expressed as mean seedling length in centimetre. The same seedlings were used for measuring weight and were kept in butter paper bags in an oven maintained at 100 ± 2°C for 24 hrs. After drying, the seedlings were kept for cooling in desiccators. The dried seedlings weight was recorded and means dry weight was expressed in milligrams. The total number of normal seedlings that emerged on the next day was considered first count of germination.

Results and Discussion

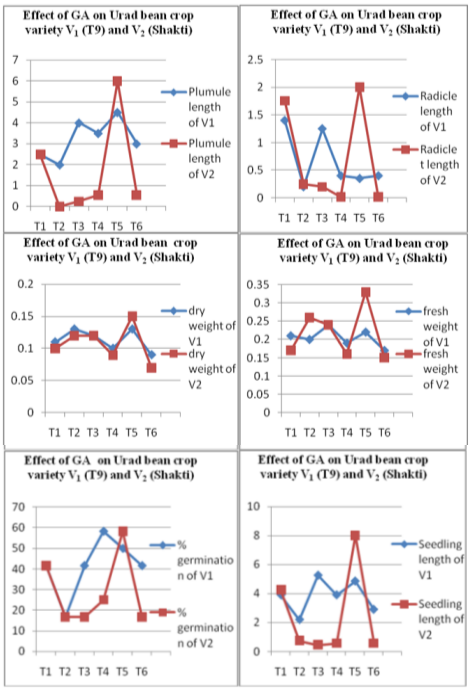
The results achieved show that various concentration of the applied Gibberllic acid affected all germination parameters of both the varieties of urad bean. It was observed that variety V1 responded better as compared to V2 to different concentration of GA. Best germination parameters were observed in treatment T5 in which GA was applied to plants in concentration of 300 ppm. The variety V1 showed better germination parameters viz.

germination %, fresh and dry weight, plumule, radicle and seedling length than in Variety V2. Lot of variation was seen variety V2 but on the other hand similar type of trend was seen in variety V1. Similarly these findings have been reported by Khan and Samiullah (2003) and Thakare *et al.* (2011).

The data pertaining to seed germination behavior of urad bean (variety V1 and V2) as influenced by different concentrations of GA are presented in the Figure 1.The best germination was observed in 300 ppm followed by control, 50ppm,100ppm,500ppm then in 10ppm. For seedling growth of two varieties, better growth was observed in variety V1 then in V2. In V1 variety highest radicle length was observed in T1 which was 1.40 followed by 1.25 in T3, 0.40, 0.40 in T4 and T6, 0.35 in T5 and then 0.20 in T2. In V2 variety highest radicle length was observed in T5 which was 2.0 followed by 1.75 in T1, 0.20 in both T2 and T3, 0.017 and 0.017 in T4 and T6 respectively. In V1 variety highest plumule length in cm was observed. In V2 variety highest plumule length was found in T5 treatment.

In V1 variety highest seedling length was observed in T3 which was 5.25 followed by 4.85 in T5, 3.90 in both T1 and T4, 2.90 in T6, 2.20 in T2 treatment. In V2 variety highest seedling length was seen in T5 which was 8.0 followed by 4.25 in T1, 0.75 in T2, 0.56 in both T4 and T6, 0.45 in T3. From the study of variation in seed germination and radical and plumule elongation under the influence of different treatments, the pre-soaking with different hormones, it was obvious that pre-soaked seed were better in germination and these observations were found to be in accord to the observations of Ahmad *et al.*, (1998); Harris *et al.*, (1999).

Figure.1 Effect of Gibberllic Acid on Urad Bean Crop Variety V1 (T9) and V2 (Shakti)



Regarding observations of fresh and dry weight, in V2 variety highest fresh weight was observed in T whereas in V2 variety highest fresh and dry weight were observed in T2 and T3. The soaking period of 24 hrs augmented the biochemical changes for germination. Same experiment was conducted in Black gram and Horse gram by Mohanty and Sahoo (2006). In V1 variety highest germination percentage was observed in T4 which is 58.33% and the lowest was observed in T2 which is 16.66%. In V2 variety highest germination percentage was observed in

T5 which is 58.33% and the lesser were observed in T2, T3 and T6 treatments. Gibberellic acid was found to quite effective to the regulation of radical and plumule elongation which support the report of Chakrabarti and Mukherji (2003).

Similarly the role and correlation between gibberllic acids concentration in plants and their effect on seed germination in cowpea has been reported earlier (Chudasama and Thaker, 2007).

Conclusively in the present research work, the impact of Gibberllic acid on germination parameters was found on both the varieties of Urad bean under study. The plant growth regulator had distinct effect on the overall seed germination and growth. Variety V1 showed better germination parameters as compared to variety V2. Seed germination in an important phenomenon which determines the future development of the crop plant. If the favorable conditions are provided to the seed under germination, then improved germination and seedling establishment happens which result in the enhanced yield. Thus overall it can be concluded that plant growth regulators are effective in regulating and enhancing different parameters of seed germination. It will help to draw the information of timing and control of seed germination and seedling growth of test species in nature.

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