Influence of Infra Red Radiation on Germination Efficiency, Seedling Growth, Vigour Index and Biochemical Constituents in Summer Mungbean (Vigna radiate L.).

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ABSTRACT-

A pot/lab experiment was conducted during summer season of 2011 at the research farm of Directorate of Seed Research, Kushmaur, Mau with mungbean variety Samrat (PDM 139) to find out the effect of varying doses of IR radiation (30, 60, 90, 120, and 150 sec.) exposure on germination, seedling growth, seedling dry weight, vigour index and Nitrate assimilation enzymes. Result obtained revealed that there was differential response of IR-radiation on different seed quality parameters. Out of Radiation doses exposed, 30 sec. of exposure enhanced root length, shoot length, seedling dry weight & vigour index I up to 18.28%, 29.47%, 24.83%, &14.1% respectively. Activities of Nitrate assimilation enzymes showed differential response against the exposure of IR- Radiation, the maximum activity of Nitrate reductase was noted with 60 sec. whereas the Nitrite reductase activity was maximum with 90 sec. Conclusively exposure of IR-Radiation for 30 sec. favors only the seed quality parameters but the Nitrate assimilation enzymes showed their maximum activity in the range of 60 to 90 sec.

I INTRODUCTION

Pulses constitute an integral part of Indian agriculture because of their vital role in enriching the human diet as well as soil fertility. Besides their higher nutritional value, pulse crops have a unique characteristic of maintaining and restoring soil fertility through biological nitrogen fixation and thus play a vital role in sustainable agriculture (Asthana, 1998). India is the largest producer and consumer of pulses in the world accounting for 33% of world's area and 22% of world's production of pulse. In India mungbean is grown on an area of 3.44 million ha.with production of 1.40 million ton with a productivity of 406 kg/ha (Agropedia, 2011). There are number of problems with germination in mungbean seeds causing relatively less germination, deformed seedlings or have no growing tips or leaves, seedlings and plants stunted when they are emerged. Therefore, to overcome from these problems of germination many techniques have been tested in the past by researchers including Infra red exposure. Infra- Red exposure is one of technique which can be used to enhance the germination and vigour ability in Mungbean crops.

In national and foreign bibliography there are many paper providing the favorable effects of infra-red on size of yield and some time also on quality (Prodleoeny *et al.* 2001). The present experiment is aimed to understand the influence of infra-red exposures of varying doses on seedling germination, growth of root and shoot and its development in terms of dry weight gain and activities of assimilatory enzymes of nitrate metabolism in mungbean plant.

II MATERIAL AND METHODS

One year old farmer saved seed mungbean variety samrat was collected from Mau district of U.P. The collected seeds were initially treated with IR radiation at the distance of 30 cm with varying exposure time including 30 Seconds, 60Seconds, 90Seconds, 120Seconds & 150Seconds and seeds that have not given any treatment was taken as control. The treated mungbean seeds were used for germination test as per the ISTA procedure under lab condition and the percentage was recorded on the basis of final count (Anonymous 1999). The same sets of treatments were sown in cemented pots @05seeds/pot filled with 15 kg well pulverized moist soil and added with recommended dose of NPK (25:50:40 kg/ha). After sowing, the germination count was started just after one day and counted up to 14^{th} day and the emergence was recorded by counting total number of seeds germinated and survived up to 14^{th} day in each treatment (Fehr *et al.*1977) Other seed quality parameters including seedling length, seedling dry weight and vigour (I & II) were also recorded according to method suggested by (Abdul-baki & Anderson 1973). The nitrate and nitrite reductase activities were assayed following the method of (Jaworkjski 1971) and (Ferari and Varner 1971) after 20 days of sowing.

III RESULT

(a) **Germination percentage:** - The data depicted in the table 1 clearly revealed that the one year old seed of mungbean variety Samrat when treated with increasing doses of IR radiation the germination percentage was increased with increasing doses up to 120 sec. but beyond the 120 sec. the doses showed the deleterious effect on germination percentage of mungbean seed.

(b) **Speed of germination**:-The data depicted in table 1 clearly revealed that the speed of germination was increased with increasing doses of IR radiation up to 150 sec. Maximum speed of germination was obtained on 150 sec. The magnitude of increase was in increasing order with each of doses applied.

(c) **Root length:** - The data observed in the table 1 clearly revealed that the root length in mungbean seedling was much with the treatment of IR 30 sec. and it was followed by 60 and 90sec. The doses beyond 90 sec.

showed deleterious effect and as the result the length of root was decreased over control.

(d) **Shoot length:**-The data recorded in the table 1 clearly revealed that the maximum shoot length was obtained on 30 sec followed by 60 and 90 sec. but beyond this limit the doses become deleterious and as a result the length of shoot was decreased over control.

(e) **Seedling dry weight**:-The data collected on dry weight of seedling is depicted in table 1 clearly indicated that the seed treatment up to 120sec. enhance the dry weight of seedling over control. The maximum seedling dry weight was recorded on 30 sec. followed by 60, 90 and 120 sec. The treatment of 150 sec. was deleterious and seed dry weight was badly affected.

(f) **Vigour index I:** - Vigour index I is the product of germination percentage x seedling length. The data presented in the table 1 clearly indicated that the maximum vigour index I was observed when the seed were treated with 30 sec. followed by 90, 60and and 120 sec. over untreated control.

(g) **Vigour index II:** - Vigour index II is the product of germination percentage x seedling dry weight. The data presented in the table 1 clearly revealed that the maximum vigour index II was obtained with 120 sec followed by 150, 90, and 60sec.

(h) **Nitrate reductase assay**: - Nitrate reductase activity is the indicator of nitrate assimilation in the growing seedling. The data depicted in table 1 clearly revealed that when seed of mungbean treated with IR radiation, nitrate reductase enzyme activity was increased with the increasing doses of IR radiation and the maximum enzyme activity was recorded at 60 sec followed by 90, 120, 150 and 30 sec.

(i) **Nitrite reductase assay:** - Nitrite reductase activity is the indicator of nitrite assimilation in growing seedling. The data depicted in table 1 clearly revealed that when seeds of mungbean treated with IR radiation, nitrite reductase activity (NIR), was increased with the increasing doses of IR radiation. Maximum enzyme activity was recorded at 90 sec. followed by 60, 120, 150and 30sec.

Table 1: Effect of various doses of IR-Radiation on seed quality parameters and enzymes activity in mungbean crop.

Treatments	Germination %	Speed of germination	Seedling length(cm)		Seedling dry weight (mg)	Vigour index I	Vigour index II	Nitrate Reductase	Nitrite Reductase
			Shoot Length	Root length					
Contro.	9[illegible]	4.510	33.74	11.23	145.0	4471.20	13.15	0.4540	0.5374
IR-30 Sec.	9[illegible]	4.510	43.63	13.01	18..0	5097.60	16.29	0.4954	0.5465
IR-60 Sec.	93	4.770	39.30	11.21	178.0	4697.43	16.55	0.5944	0.6214
IR-90 Sec.	96	4.810	38.67	10.31	162.0	4744.38	11.18	0.5870	0.6244
IR-120 Sec.	100	4.810	35.17	5.63	147.0	4464.00	14.70	0.5640	0.6014
IR-150 Sec.	95.65	4.850	30.17	3.17	130.0	3408.81	11.16	0.5460	0.5863

IV DISCUSSION

In the past, numbers of scientist have studied the response of different classes of radiation on germination, growth and vigour & various enzymes activity in different species. The response of IR-radiation differs with dose, time of exposure and type of species. Effect of IR-Radiations on different crop species reported by number of researchers (Oladiran Fasina, *et. al* 2001, Podlesny J., 2002, Wilczek M. 2004, Podlesny J. and Podlesna A. 2004, Abdelghafar Abu-ElsaoudE, *et.al* 2008, Hernandez-Vizuet M .and Michtchenko. A., 2010, Michtchenko and M. Hernández, 2010, Floarea Burnichi, 2011).

In the present investigation proper doses (30, 60, 90, 120, and 150 sec.) of IR radiation have been applied to the seed of mungbean at the 30 cm distance. The responses on germination, seedling growth, seedling dry weight, vigour index and nitrate assimilatory enzyme have been studied. The doses of IR radiation have their differential response on different parameter. The IR radiation enhanced the germination percentage (11.1%), speed of germination (7.78 %), root length (18.27%), shoot length (29.47%), seedling dry weight (24.83%), vigour index-I (14.1%), vigour index-II (38.69 %), nitrate reductase activity (31.94%) and nitrite reductase activity (25.93%) in mungbean crops.

Our findings are supported by many researchers (Oladiran Fasina, *et. al* 2001, T G Pereira and A. Oliva-Teles 2002, Podlesny J. and Podlesna A., 2004, Abdelghafar Abu-ElsaoudE, *et.al* 2008, Hernandez-Vizuet M .and Michtchenko. A.,2010) who reported that there was a positive response of IR-Radiation on germination, seedling growth , seedling dry weight, vigour index and nitrate assimilatory enzymes activities.

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