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Short Note

Impact of Pre- Sowing Seed Treatments on Seed Quality Attributes and Pod Yield in Groundnut (*Arachis hypogaea L.*)

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ABSTRACT

Present investigation was undertaken to know the effect of pre-sowing seed treatments on seed quality and yield of groundnut genotype VLG1. Two seed lots of groundnut viz. fresh (high vigour) and revalidated seed (low vigour) were subjected and their efficacy was evaluated during *Kharif* season. Pre-sowing seed invigoration by hydration for 16 h and air drying at room temperature followed by dressing with Thiram 75% D.S @ 0.25 per cent registered consistently and significantly higher pod yield than untreated seeds in both lots. The higher pod yield resulted from significantly improved germination, speed of emergence, per cent field emergence, ultimately the better crop establishment and in turn higher plant stand. The beneficial effects of hydration followed by Thiram dressing were more pronounced in the low vigour seed lot (revalidated) than in the high vigour lot (fresh).

Keywords: Hydro priming, crop establishment, pod yield, Groundnut

Groundnut is one of the most important oilseeds crop and also a food crop of leguminous family (Singh et *al*, 2013). During the year 2007-08 it was grown in an area of 6.9 million hectare with annual production of 8.22 million tonnes. The overall productivity of this crop in India is quite low (11.88q/ha). Usually, farmers are using their own saved seed. The low vigour and viability, many time combined with adverse environmental conditions result in poor crop establishment and ultimately the decreased crop yield (Singh et *al*, 2014). Sometimes non availability of certified fresh seed may compel the use of old revalidated seed lot and consequently results in poor yield due to non adoption of good agronomic practices which is an efficient and eco-friendly tool for sustainable management of plant diseases under changing climate scenario also, since ground nut is attacked by numerous disease and insects pests (Singh *et al*, 2012). Under these circumstances, seed invigoration treatments may help in proper crop establishment and to avoid the substantial loss in the yield. Not only that any class of the seed viz., breeder, foundation or certified can be given pre sowing seed invigoration treatment. This is most vital when seed is a costly input as in case groundnut. A number of pre sowing seed invigoration treatments have shown better seedling performance and crop establishment, and ultimately increased yield in several crops (Kundu and Basu, 1981; Singh *et al*., 2004; Khan *et al*., 2002 and Singh *et al*., 2002), including groundnut (Narayanaswamy and Channarayappa,1996 and Dhedhi *et al*., 2007). In view of this, the present study was taken up to find out the impact of pre sowing seed invigoration treatments for better crop establishment in groundnut.

Two seed lots of groundnut cultivar VLG- 1 viz., fresh seed lot (high vigour seed with germination percentage ≥ 90 %) and old seed lot (low vigour seed with almost MSCS level of germination- revalidated) was included in the study. Both seed lots of groundnut were subjected to seven pre-sowing seed treatments namely hydration for 16 h followed by air drying at room temperature (T_1), Cold hydration for 72 h at 10 ^{0}C and surface drying (T_2), hydration with 50 ppmGA3 for 16 h followed by surface drying at room temperature (T_3), osmo-conditioning (poly ethylene glycol) solution (-10 bars) for 15 0C for seven days (T_4), hydration for 16 h and drying followed by dressing with Thiram (75%DS)@0.25 per cent (T_5), hydration with 2% KH_2PO_4 (potassium dihydrogen phosphate) for 16 h followed by drying at room temperature (T_6) and dry seeds without any treatment using as a control (T_0).

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Two separate experiment using fresh and revalidated seed were conducted employing seven pre-sowing seed invigoration treatments at Seed Production Unit of Krishi Vigyan Kendra (ICAR-VPKAS-Almora), Chinyalisour, Uttarkashi in randomized block design (RBD) with four replications adopting the recommended package of practices during *Kharif* 2007, 2008 and 2009. Two hundred counted seeds were sown in four rows of 5 m length in each plot. For estimation of speed of emergence in the field trials, number of normal seedling emerged out per 100 seeds, daily were counted. The speed of field emergence was calculated as suggested by Maguire, 1962. Final plant stand was recorded at maturity. Pod yields were recorded on plot basis and converted to pod yield per hectare. The treated seeds of both the lots were also tested for laboratory germination as per the procedure of ISTA rules (Anonymous, 1999). After the final germination count 10 normal seedlings from each replication were taken randomly, oven dried at 80 ^{0}C for 17 h and weighted for seedling dry weight. The data of fresh and revalidated seed lots of groundnut were separately subjected to simple RBD analysis and pooled over years and results are presented in table 1 (high vigour lot) and table 2 (low vigour seed lot), respectively.

In fresh seed lot of groundnut cultivar VLG-1, significant differences in per cent germination, speed of emergence, seedling dry weight, per cent field emergence, plant stand and pod yield were observed due to different pre-sowing seed treatments in individual years as well as in the pooled one but the treatment x year interaction was also significant for all the characters studied (Table 1). Although, pre-sowing seed invigoration by hydration for 16 h and drying at room temperature followed by dressing with Thiram @0.25 per cent (FT_5) recorded the highest pod yield in all the three years as well as in the pooled one but the values were not significantly higher than the control in two out of three years. Nevertheless, pooled data exhibited significantly higher pod yield in this treatment as compared to untreated seeds when tested against interaction CD. The beneficial effects of this treatment (FT_5) were also found in respect to per cent germination, speed of emergence, seedling dry weight, per cent field emergence and final plant stand in all the three years. Hydration at room temperature (FT_1) or cold hydration (FT_2) did not show any significant differences when compared with control in regards to any of the parameters studied. Hydration with 50ppm GA_3 (FT_3) and 2 % KH_2PO_4 (FT_6) for 16nh followed by surface drying were also found to have adverse effects on per cent germination, speed of emergence, per

Table 1: Effect of pre-sowing seed treatments on seed quality attributes and pod yield in fresh seed lot of groundnut

Treatment	Germination (%)				Speed of emergence				Seedling dry weight (mg)				Field emergence				Pod yield/ha (kg)			
	2007	2008	2009	pool	2007	2008	2009	pool	2007	2008	2009	Pool	2007	2008	2009	pool	2007	2008	**2009**	**Pool**
FT_0	97.00	92.00	97.00	95.30	9.59	9.45	4.38	7.81	0.258	0.335	0.472	0.355	80.25	82.75	79.50	80.83	1213	752	1381	1115
FT_1	96.00	92.50	96.25	94.92	8.44	9.66	4.56	7.56	0.237	0.299	0.423	0.320	72.75	84.75	82.00	79.83	1091	766	1408	1088
FT_2	89.00	83.25	83.25	85.17	9.85	8.38	4.43	7.55	0.270	0.343	0.405	0.339	83.25	77.00	82.50	80.92	1182	705	1300	1062
FT_3	82.00	82.00	88.00	84.00	5.91	8.23	3.78	5.97	0.238	0.321	0.405	0.321	51.25	67.75	68.50	62.50	674	604	1225	835
FT_4	2.50	37.50	32.50	24.17	3.90	2.83	1.51	2.75	0.233	0.288	0.350	0.291	36.75	27.25	25.75	29.92	460	256	260	326
FT_5	98.00	96.75	97.25	97.33	10.12	9.94	4.96	8.34	0.289	0.374	0.482	0.382	85.50	89.00	89.00	87.83	1312	813	1758	1294
FT_6	90.00	81.50	81.00	84.17	6.30	7.08	4.16	5.85	0.266	0.322	0.412	0.334	56.25	65.00	76.00	65.75	753	594	1160	836
Treat (T) S.Em±	1.17	3.17	2.03	4.74	0.41	0.41	0.04	0.58	0.006	0.007	0.015	0.011	3.27	3.64	1.02	3.60	33.33	16.67	66.67	100.00
Treat. CDat 5%	3.47	9.41	6.03	14.61	1.23	1.21	0.12	1.79	0.019	0.022	0.046	0.034	9.71	10.83	3.04	11.10	116.67	66.67	200.00	300.00
TxY S.Em±	-	-	-	2.27	-	-	-	0.34	-	-	-	0.011	-	-	-	2.89	-	-	-	50.00
TxY CD at 5%	-	-	-	6.45	-	-	-	0.95	-	-	-	0.030	-	-	-	8.19	-	-	-	133.33
C.V %	2.96	7.89	4.97	5.67	10.88	10.36	2.01	10.42	5.24	4.57	7.53	6.50	9.97	10.49	2.89	8.41	8.64	8.50	12.38	11.25

Where, F = Fresh groundnut seed, T= treatment, Y= year

cent field emergence, and pod yield as compared to control. Osmo-conditioning (FT_4) treatment had highly detrimental effects resulting in inhibition of germination and in turns all the other parameters.

In the revalidated seed lot of groundnut (Table 2), significant differences were observed among the pre sowing seed treatments for per cent germination, speed of emergence, seedling dry weight, per cent field emergence , plant stand and pod yield in individual years as well as in pooled analysis, and the interaction (Treatment x year) was also found significant. Among the pre-owing seed treatments, hydro-priming, followed by Thitam dressing @ 0.25 % per cent (RT_5) produced consistently and significantly higher pod yield than untreated seeds in all the three years. Moreover, the value was significantly higher than the control with respect to the pod yield in pooled analysis when tested against (YxT) interaction CD. More or less similar trend of seed invigoration (RT_5) was observed in per cent germination, speed of emergence, seedling dry weight, per cent field emergence and final plant stand in individual as well as in pooled analysis over years. Results are in accordance with the earlier reports (Anonymous, 2003-04 and Anonymous, 2004-05). In the present study, the year X treatment interaction was found to be significant due to inconsistency in other treatments. As in case of fresh seed lot, hydro- priming seed treatment (RT_1) prior to sowing did not show any significant effects as compared to control. The other pre-sowing seed treatments also did not manifest any significant superiority over control for pod yield and other attributes studied. On the contrary, many a times, an adverse effect was discernible. Most pronounced detrimental effect was observed due to osmo- conditioning with PAG. The latter has been reported to be extremely detrimental, resulting in complete inhibition of germination (Anonymous, 2003-04).

The response to different pre-sowing treatments was almost similar in both fresh and revalidated seed lots. However, hydro-priming followed by Thiram dressing with 2.5 gm / kg seed was more effective in low vigour seed than in high vigour seed. Thus, pre-sowing treatment in low vigour seeds of Groundnut with hydration for 16 h followed by air drying and Thiram dressing @ 0.25 per cent resulted in significantly higher germination, speed of emergence, per cent field emergence, ultimately better crop establishment and in turn increase in pod yield. There are reports of germination vigour promotion and ultimately the yield by hydro- priming (Khan, 2003) and Thiram seed dressing in groundnut as well as other crops (Singh *et al.*,

Table 2: Effect of pre-sowing seed treatments on seed quality attributes and pod yield in revalidated seed lot of groundnut

Treatment	Germination (%)				Speed of emergence				Seedling dry weight (mg)				Field emergence				Pod yield/ha (kg)			
	2007	2008	2009	Pool	2007	2008	2009	pool	2007	2008	2009	Pool	2007	2008	2009	pool	2007	2008	2009	Pool
RT_0	76.00	75.50	70.75	74.08	3.72	7.49	3.45	4.87	0.335	0.384	0.394	0.371	42.50	72.75	64.00	59.75	371	657	935	654
RFT_1	68.75	80.50	72.25	73.83	3.26	7.74	3.56	4.86	0.290	0.345	0.402	0.346	34.75	74.25	67.25	58.75	361	676	1108	715
RT_2	55.50	70.25	67.25	64.33	1.38	6.71	3.38	3.82	0.332	0.381	0.387	0.367	17.00	65.50	63.75	48.75	284	588	1077	650
RT_3	64.00	77.50	70.50	70.67	2.14	7.76	3.41	4.44	0.353	0.393	0.347	0.354	25.00	73.00	63.25	53.75	251	635	946	611
RT_4	1.00	32.75	17.00	16.92	0.10	1.17	0.55	0.61	0.232	0.302	0.263	0.191	1.00	12.50	10.25	7.92	100	163	242	168
RT_5	78.50	85.50	79.50	81.17	5.61	8.57	3.87	6.02	0.412	0.412	0.397	0.383	64.50	79.50	72.50	72.17	507	728	1354	863
RT_6	36.75	72.50	66.50	58.58	2.98	6.32	3.36	4.22	0.355	0.355	0.388	0.348	33.50	67.25	63.50	54.75	343	612	1019	658
Treat (T) S.Em±	2.12	3.25	2.20	4.20	0.24	0.21	0.11	0.56	0.009	0.009	0.010	0.030	2.30	2.15	1.95	4.93	16.67	16.67	33.33	66.67
Treat. CDat 5%	6.30	9.65	6.54	12.95	0.70	0.63	0.34	1.74	0.027	0.027	0.029	0.093	6.84	6.40	5.80	15.18	50.00	50.00	116.67	233.33
TxY S.Em±	-	-	-	2.57	-	-	-	0.20	-	-	-	0.010	-	-	-	2.14	-	-	-	33.33
TxY CD at 5%	-	-	-	7.30	-	-	-	0.55	-	-	-	0.029	-	-	-	6.07	-	-	-	83.33
C.V %	7.95	9.33	7.05	8.33	17.86	6.61	7.56	9.68	5.00	5.00	5.47	6.18	15.26	6.89	6.88	8.59	13.26	7.92	9.27	10.32

Where, R= Revalidated groundnut seed, T= Treatment, Y= Year

2002; Anonymous, 2003-04 and Ram *et al.*, 2002). Thiram appears to act not only as a fungicide but as a promoter of germination vigour.

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