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Research Article

EFFECT OF SEED TREATMENT (SOAKING CUM INCUBATION) ON PLANT POPULATION MAINTENANCE OF MAIZE (*ZEA MAYS* L) UNDER RAINFED CONDITIONS DURING WINTER SEASON AT PARWANIPUR, BARA, NEPAL

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Abstract

Non-primed top quality seed of maize having cent-percent germination in lab resulted only 61% emergence in the field based on 4806 observations for non-primed seed while treated seed (priming cum incubation) recorded 82 % emergence in the field based on 4806 observations during first year. During second year experiment also non-primed top quality seed of hybrid maize having cent-percent germination in lab resulted 71.29% emergence while priming cum incubation treatment recorded 91.84% emergence. The result of both years clearly indicates the importance of seed treatment for maintaining the optimum plant population and there by insuring higher yield of winter hybrid maize.

Keywords: Priming; emergence; incubation; germination; plant population.

Introduction

In winter season under rain-fed condition maintenance of optimum plant population is a great challenge for winter maize production due to low temperature in spite of germination through lab test. Once the crop is sown and if required plant population is not obtained. Gap filling becomes essential. However plants obtained by gap filling cannot grow properly because of competition for light, nutrient, water and CO_2 and shading effect of plants emerged earlier. On the other hand, gap filling involves additional cost. By visual observations also, great variability between earlier plant emerged and plants emerged through gap filling with respect to plant height, no of leaves, overall health of plant are observed, ultimately resulting into serve reduction in yield of maize. Good quality seeds imply vigour, uniformity and structural soundness besides its physical purity. Seed priming cum incubation being non-monetary input is an effective seed invigoration methods have become a common seed treatment to increase the rate and uniformity of emergence and crop establishment, Farmers are using non-primed seeds which usually germinates slowly and also lacks poor emergence percentage, having poor crop establishment, lack proper vigor that results in low yield. Seed priming also reduces the time required that seeds spend on seed bed simply imbibing water from the soil to minimum and leads to improve seedling emergence (Murungu *et al.,* 2004). Seed priming and incubation hastens the bio-chemical activities within the seed resulting into quicker germination and emergence and thereby maintain sufficient plant population in the field as compared to non-primed seeds (Chivasa *et al.,* 2000).

Primed seed usually emerges from the soil faster and more uniformly than non-primed seed of the same seed lots. These differences are greatest under adverse environmental condition in the fields such as cold or hot soil. There may be little or no difference between primed and non-primed seed if the field's conditions are closer to ideal. Ninety seven farmers tested maize seed priming in tribal areas of Rajasthan, Gujarat and Madhya Pradesh, India. They reported in pre and post-harvest focus group discussion that primed crops emerged 2-3 days earlier than non-primed ones and resulted in better, more uniform stands. Almost all farmers thought that primed crops grew more vigorously and better competitions with weeds was mentioned, flowered and mature earlier and produced bigger cobs and higher yields. Almost hundred percent farmers intended to continue priming in future (Harris *et al.,* 2001a).

Materials and Methods

The field experiment was conducted to study the emergence percentage of maize seed under different seed treatments in order to maintain optimum plant population for the main experiment at Regional Agriculture Research Station, Parwanipur, Bara, Nepal. The experiment consisted three blocks. Each block consisting of 30 plots each of size 1.8×3.6 sq. meter. R to R was spacing 60cm and plant to plant spacing 20 cm and variety Raj Kumar, certified hybrid seed was used. In each plot 54 plants required. In each plot six row and in each row nine plants required. At each plant sites two seeds were planted. Out of the two seed one was primed cum incubated seeds and other was non-primed seeds. Primed cum incubated seeds was sown just by the north side of non-primed seeds at every plant sites in all the blocks and observation on emergence of plant recorded. Crop was sown on 27th November 2010 and observation on plant emergence was recorded on 14th December 2010 after 17 days of growing. Similarly study was conducted on 2011 also. Seed treatment i.e. priming cum incubation followed 24 hrs soaking of seeds in water in a container followed by placing the seeds in a clean and moist jute bag, fold the bag tightly and keep it in shady place. Seeds were stirred after every 12 hours for better air circulation and sprinkle water over seeds, incubation period i.e. keeping in jute bag for 24 hrs.

Result and Discussion

After recording the data on emergence only one healthy plants was kept at each plant site out of the two seeds sown. The objective of this observation was confined to find out the emergence percent of maize seed under different seed treatment under rain-fed condition in winter season and hence the result of the only one character that is emergence percentage was discussed (Table 1 & 3). In general, plant emerged from priming cum incubation was found higher and healthy one than plant emerged from non-primed seed (Table 2 & 4). Therefore, at each plant sites healthy plants and higher number of plant obtained from priming cum incubation treatment was kept and rest (plant from non-primed seed) was removed.

Emergence % for non-primed seed was recorded 71.29% whereas, 91.85%.mergence % of priming cum incubated seed

Table 1: Germination % in Lab by Towel Paper method (2010)

Rep I	25 seeds tested	25 seeds emerged
Rep II	25 seeds tested	25 seeds emerged
Rep III	25 seeds tested	25 seeds emerged
Rep IV	25 seeds tested	25 seeds emerged
Germination %	100	

Table 2. Effect of seed treatment (Soaking cum incubation) on emergence percent of maize 2010

	Rep 1			Rep 2			Rep3		
No. of Seed sown	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation seed**	**Non-primed Seed**
54	1	36	26	31	45	33	61	38	25
54	2	52	41	32	35	19	62	50	41
54	3	45	24	33	50	45	63	53	41
54	4	37	24	34	35	20	64	43	21
54	5	31	12	35	53	37	65	50	40
54	6	35	20	36	52	49	66	50	40
54	7	46	29	37	48	29	67	48	37
54	8	38	30	38	50	40	68	53	43
54	9	51	41	39	48	32	69	51	45
54	10	49	39	40	50	48	70	36	16
54	11	29	26	41	52	52	71	32	16
54	12	52	41	42	40	24	72	50	38
54	13	48	40	43	46	37	73	54	38
54	14	49	42	44	38	26	74	45	36
54	15	46	25	45	52	38	75	52	40

	Rep 1			Rep 2			Rep3		
No. of Seed sown	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation seed**	**Non-primed Seed**
54	16	44	30	46	52	49	76	43	29
54	17	42	29	47	51	45	77	41	27
54	18	50	43	48	52	49	78	50	34
54	19	53	51	49	35	20	79	51	38
54	20	26	16	50	26	34	80	28	14
54	21	33	32	51	43	26	81	36	19
54	22	52	37	52	20	17	82	54	51
54	23	52	47	53	52	42	83	53	50
54	24	50	34	54	45	38	84	41	28
54	25	23	8	55	59	43	85	40	25
54	26	30	24	56	53	45	86	42	20
54	27	41	26	57	52	44	87	39	21
54	28	35	16	58	52	44	88	52	37
54	29	53	43	59	45	33	89	46	36
54	30	0	0	60	52	50	90	35	23
		1228	896		1388	1108		1356	969

Calculation of emergence % = $\frac{1228}{1566}$ = 78% for primed seed and Replication I

Emergence % = $\frac{896}{1566} \times 100$ = 57% for non-primed seed and Replication I

Emergence % = $\frac{1388}{1620} \times 100$ = 85% for primed seed and Replication II

Emergence % = $\frac{1108}{1620} \times 100$ = 68% for non-primed seed and Replication II

Emergence % = $\frac{1350}{1620} \times 100$ = 83% for primed seed Replication III

Emergence % = $\frac{969}{1620} \times 100$ = 59 for non-primed seed Replication III

Emergence % of non-primed seed
= $\frac{57+68+59}{3}$ = 61%

Emergence % of primed seed
= $\frac{78+85+83}{3}$ = 82%

Table 3. Germination % in Lab by Towel Paper method (2011)

Rep I	25 seeds tested	25 seeds emerged
Rep II	25 seeds tested	25 seeds emerged
Rep III	25 seeds tested	25 seeds emerged
Rep IV	25 seeds tested	25 seeds emerged
Germination %	100	

Table 4. Effect of seed treatment (Soaking cum incubation) on emergence percent of maize 2011

	Rep 1			Rep 2		
No. of Seed sown	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**
108	1	98	73	16	104	78
108	2	101	87	17	100	85
108	3	101	54	18	107	76
108	4	106	85	19	91	63
108	5	103	72	20	102	66
108	6	103	69	21	94	73

	Rep 1			Rep 2		
No. of Seed sown	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**	**Plot No.**	**Priming cum incubation Seed**	**Non-primed Seed**
108	7	94	74	22	105	89
108	8	101	82	23	105	58
108	9	83	77	24	96	73
108	10	100	93	25	97	83
108	11	91	93	26	102	88
108	12	97	84	27	101	79
108	13	98	83	28	99	64
108	14	103	71	29	100	85
108	15	90	84	30	104	69
Total		1469	1181		1507	1129

Calculation of emergence %

1) Emergence % for non-primed seed = 1181+1129/3240= 2310/3240X100=71.29%
2) Emergence % of priming cum incubated seed = 1469+1507/3240= 2976/3240X100=91.85%

Summery and Conclusion

Even top quality seed having cent-percent germination in lab may not result into cent-percent emergence in the field without seed treatment and thereby results into poor plant population and less yield per hectare. Under rainfed condition during winter season, thus effect the seed demand when non primed seed more seed required and when priming cum incubated seed less seed required and avoid gap filling operation and reduce cost on extra seed for gap filling.

In rainfed condition seed treatment i.e. priming cum incubation may be recommended for almost all crops to obtain the maximum advantage of top quality hybrid and improved seed which is very costly input to farmers. Seed quality control should also advocate about how maximum emergence percentage can be obtain. So, there should be good match between higher germination with higher emergence. Our findings show similarity with the previous findings (Harris *et al.*, 2001a). Therefore, we recommend farmers to continue priming in future.

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