

Effects of Seed Treatment (Soaking cum Incubation) on Plant Population Maintenance and Growth of Maize (*Zea mays* L) Crop Under Rainfed Condition During Winter Season at Rampur

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Abstract – Certified seed of maize having hundred percent germination in lab resulted average number of leaves per plant 8.66, average height of the plant 60 cm and only 33 percent emergence in the field based on 4860 observation for non primed seed after 21 days of sowing while treated seed (priming cum incubation) recorded average number of leaves per plant 11.6, average height of the plant 99 cm and 61 percent emergence in the field based on 4860 observations for priming cum incubation of seed after 21 days of sowing. The result obtained for emergence percent, height of the plant and number of leaves per plant clearly indicates the importance of the seed treatment for maintaining optimum plant population and allowing the faster growth of the plant by seed treatment (priming cum incubation) as compared to non primed seed.

Keywords – Priming, emergence, incubation, germination, plant population.

I. INTRODUCTION

In winter season under rainfed condition maintenance of optimum plant population is a great challenge for winter maize production due to low temperature in spite of hundred percent 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 can not grow properly because of competition for light, nutrient, water and CO₂ 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 percent, have 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 (Hartman et al., 2002). 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 (Ashraf et.al, 2005).

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. 1999.

II. MATERIALS AND METHODS

The field experiment was conducted to study the emergence percent of maize seed under different seed treatments in order to maintain optimum plant population for the main experiment at Institute of Agriculture and Animal Science Rampur, Chitwan, 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 shown on 1st December 2010 and observation on plant emergence, plant height and average number of leaves per plant was recorded on 22th December 2010 after 21 days of growing. 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. Stir the seeds after every 12 hours for better air circulation and sprinkle water over seeds, incubation period i.e. keeping in jute bag for 24 hrs.

III. 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 rainfed condition in winter season and hence the result of the only one character that is emergence percentage was discussed. In general, plant emerged from priming cum incubation was found higher, taller and healthy one than plant emerged from non primed seed. 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.

Table 1. GERMINATION % IN LAB (2010)

Towel Paper method:

		Emerged
Rep I	25 Seeds tested	25
Rep II	25 seeds tested	25
Rep III	25 seeds tested	25
Rep IV	25 seeds tested	25
	Germination %	= 100

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

No. of Seed sown	Rep 1			Rep 2			Rep3		
	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	19	7	31	47	31	61	9	4
54	2	47	34	32	48	30	62	39	17
54	3	48	36	33	53	31	63	36	21
54	4	39	37	34	36	23	64	25	12
54	5	35	17	35	31	12	65	31	10
54	6	31	15	36	30	15	66	27	14
54	7	36	19	37	28	14	67	28	12
54	8	37	21	38	28	9	68	27	16
54	9	28	14	39	11	5	69	35	18
54	10	19	7	40	320	14	70	15	5
54	11	19	10	41	40	19	71	7	4
54	12	41	22	42	33	8	72	39	28
54	13	32	13	43	22	5	73	34	16
54	14	34	13	44	18	8	74	40	19
54	15	39	19	45	37	24	75	22	12
54	16	36	14	46	28	4	76	28	16
54	17	45	20	47	33	11	77	21	8
54	18	43	25	48	39	25	78	34	17
54	19	43	31	49	34	20	79	41	18
54	20	18	9	50	49	34	80	10	6
54	21	28	14	51	53	43	81	14	5
54	22	52	44	52	31	19	82	45	23
54	23	50	42	53	32	16	83	46	27
54	24	45	30	54	29	13	84	38	16
54	25	39	33	55	29	15	85	30	11
54	26	38	22	56	29	12	86	30	15
54	27	41	24	57	29	14	87	30	12
54	28	38	15	58	31	22	88	34	16
54	29	45	30	59	41	22	89	48	33
54	30	11	4	60	54	49	90	19	10
						total	=	2991	1639

Calculation of Emergence percent of seed = number of emerge plant / number of seeds sown X 100

Emergence percent of maize for prime seed= 2991/4860X100=61.54%

Emergence percent of maize for non prime seed=1639/4860X100=33.72%



Table 3. Effect of seed treatment (Soaking cum incubation) on plant height of maize 2010

No. of Seed sown	Rep 1			Rep 2			Rep3		
	Plot No.	Priming cum incubation Seed(Plant height cm)	Non-primed Seed(Plant height cm)	Plot No.	Priming cum incubation Seed(Plant height cm)	Non-primed Seed(Plant height cm)	Plot No.	Priming cum incubation seed(Plant height cm)	Non-primed Seed(Plant height cm)
54	31	95	49	61	56	42	91	125	56
54	32	76	46	62	145.6	78	92	98	64
54	33	92	59	63	125	95.6	93	42	46
54	34	139	69	64	137	80	94	118	72
54	35	108	59	65	81.4	49	95	109	75
54	36	98	73	66	103.4	46	96	109.4	75.4
54	37	123	63	67	124	54	97	112.6	76
54	38	105	65	68	108	66	98	44.4	46
54	39	52	42	69	122.2	39	99	98	62
54	40	111	53	70	55	45.8	100	84	77.4
54	41	108	46	71	49	48.16	101	94.4	73
54	42	57	36	72	102	54	102	115.4	65
54	43	88	51	73	92.4	51	103	47	35
54	44	148.4	86	74	123.4	65	104	144.4	81
54	45	110.82	45	75	96	60	105	93	70
54	46	118	56	76	108	55	106	109.6	66
54	47	140.8	81.4	77	110.6	83	107	79	76
54	48	84	43	78	129	77	108	46	36
54	49	56	46	79	125.8	88	109	133	62
54	50	107	49.2	80	53	45	110	104.2	76
54	51	101	50	81	68	46	111	99.6	77
54	52	72.6	44	82	10	56	112	126	56
54	53	101.6	51	83	114	63	113	64	39
54	54	110	55	84	157.6	92	114	138	70
54	55	132.4	66	85	87.8	65	115	110	70
54	56	119.2	53.6	86	74	55	116	90.6	67
54	57	134.8	77	87	139.8	72	117	91	74
54	58	81.4	46	88	123.	62	118	56.6	35
54	59	63.4	50	89	122.4	61	119	147.4	61
54	60	95.4	48	90	58	46	120	115	74
						Total	=	8975.2	5410.5

Average plant height of maize for prime seed=8975.2/90=99.72cm

Average plant height of maize for non prime seed=5410.5/90=60.11cm

Table 4. Effect of seed treatment (Soaking cum incubation) number of leaves per plant 2010

No. of Seed sown	Rep 1			Rep 2			Rep3		
	Plot No.	Priming cum incubation Seed (Number of leaves)	Non-primed Seed (Number of leaves)	Plot No.	Priming cum incubation Seed (Number of leaves)	Non-primed Seed (Number of leaves)	Plot No.	Priming cum incubation seed (Number of leaves)	Non-primed Seed (Number of leaves)
54	1	12	8.6	31	11	7.2	61	11	9.4
54	2	12	7	32	15	10.8	62	12	8.6
54	3	13	9.8	33	17	8.8	63	8	5.6
54	4	13	9.6	34	13	10	64	11	9.4
54	5	11	8.2	35	12	7.2	65	11	8.8
54	6	12	8.2	36	11	7.6	66	13	9.4
54	7	13	8.2	37	12	9.9	67	10	8.
54	8	13	8.2	38	13	8.6	68	8	5
54	9	10	6.8	39	10	9	69	12	7.2
54	10	12	7.8	40	9	6.8	70	10	7
54	11	12	9.2	41	11	6.4	71	11	9.2
54	12	10	7.4	42	12	8.4	72	11	9.2
54	13	13	8.2	43	14	8.2	73	8	6.2
54	14	13	9.4	44	12	9.2	74	13	11.4
54	15	11	8.8	45	11	8.6	75	11	8.6
54	16	13	9.8	46	12	7.6	76	12	9
54	17	11	9	47	12	9	77	12	8.2
54	18	11	11.4	48	12	10.6	78	8	6.4
54	19	9	8.	49	12	10.2	79	12	10.6
54	20	11	8	50	11	6.4	80	12	9.2
54	21	12	9.2	51	10	8.2	81	12	9.4
54	22	10	7	52	12	8.2	82	13	10.2
54	23	11	9.6	53	12	9	83	12	7.4

54	24	13	9.2	54	11	11	84	12	9.2
54	25	13	10.8	55	11	9.24	85	12	9
54	26	12	9	56	12	9.6	86	12	8
54	27	13	10.6	57	13	9.8	87	11	8.4
54	28	11	8.	58	12	8.2	88	10	7
54	29	12	8.6	59	11	11.36	89	13	9.8
54	30	11	10.4	60	10	7.6	90	12	7.6
						total	=	1044	780.1

Average number of leaves per plant for prime seed of maize = $1044/90=11.6$

Average number of leaves per plant for non prime seed of maize = $780.1/90=8.66$

IV. 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. Seed treatment of maize (Priming cum incubation) resulted higher emergence percent taller plant and more number of leaves per plant as compared to non primed seed of maize.

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