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GERMINATION AND EARLY GROWTH OF TOMATO (*Lycopersicon esculentum* L.) AS INFLUENCED BY DIFFERENT HYDROPRIMING REGIMES

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ABSTRACT

This study was carried out to determine the effect of hydropriming on seed germination, seedling emergence and growth of tomato. Treatments consisted of four hydropriming periods (0, 6, 12 and 24 hours) laid out in a completely randomised design (CRD) replicated three times. Results of the experiment revealed that Treatments were significantly effective on germination, emergence time and increased seedling size (fresh and dry weight). Although, all treatments were superior to control, 12 hours priming was found the best treatment. Results indicated that priming is effective through reducing germination time and increasing subsequent growth. Therefore priming tomato seeds could improve_seedling quality that results in vigorous plants hence, high yield.

Keywords: Germination, early growth, hydropriming regimes, tomato

INTRODUCTION

Quick and uniform field emergences of seeds are essential requirements to increase yield and quality of produce. Slow and delayed germination ability of some seeds results in smaller seedlings and consequently plants (Finch-Savage, 1993). Seed priming has been a common treatment to increase the rate and uniformity of emergence in many vegetables, where it results in a more rapid and uniform germination when seeds are re-imbibed (Gurusinghe et *al.,* 1999). Podlaski *et al.* (2002) reported that the rate of germination (inverse of time to germination) was enhanced as a result of seed priming. Other researchers such as Orzesko *et al.* (2003) and Sirwitayawan *et al.(* 2003) reported priming to have enhanced growth and hence yield of some crops.

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Tomato is an important vegetable crop grown in Nigeria for its culinary applications in homes of most Nigeria families. Majority of tomato producers in Nigeria are mostly of the peasant category that suffers a lot of production problems of which poor stand establishment in one of them. Improved agronomic practices that will increase the quality and growth rate of seedlings which in turn allow producers to have more emergence and resources is therefore of paramount.

The objective of this study was to determine the effect of priming treatments on emergence and seedling growth in tomato.

MATERIALS AND METHODS

The study was conducted in Crop Science Laboratory of Usmanu Danfodiyo University, Sokoto. Seeds of tomato cultivar Roma VF were used for the experiment. The environmental temperature during the experiment was >28^{o}C.

Three hundred seeds of tomato were primed by soaking in water for 0,6,12 and 24 hours. After soaking, seeds were washed with distilled water, and then dried. Germination test was conducted by placing 25 seeds from each treatment in 90mm diameter Petridishes on whatmans filter paper that was moistened with distilled water. A completely randomized design (CRD) was used with three replications. Radicle protrusion of 2mm was scored as germination (Kaya *et al.,* 2006). Germination was counted on daily basis until no further germination occurred for up to fourteen days.

Emergence tests were conducted within three days after drying with three replicates of 25 seeds in each treatment. Seeds were sown l-2cm deep in pots pre-fill with soil plus manure mixture in the ratio 2:1 in the biological garden of the Department of Biological Science. The growth of the seedlings was monitored for 28 days. Appearance of the hypocotyls hook on the soil surface was sued as an emergence criterion and emerged seedlings were recorded daily. Plants were irrigated with watering can at 3 days intervals. Plants height was recorded on the second, third and fourth weeks. Four weeks after plating, the seedlings were uprooted gently and oven-dried at 70^{o}C for 24 hours to determine the dry matter weight of seedlings.

The data collected was subjected to analysis of variance (ANOVA). The significance mean were compared using Duncan's Multiple Range Test (DMRT) at 5% level of probability.

RESULTS AND DISCUSSION

Priming significantly affected germination of tomato. An increase in the germination percentage was obtained with six hours priming followed by twenty four hours priming. Control treatments recorded the lowest germination percentage (Table 1). The significant difference obtained in the

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percentage germination as a result of priming means that priming might have induced germination by enzymes activation and softening of seed coat. This finding is in conformity with what was reported by researchers such as Harris (2002) in wheat, Ghassimi *et al.* (2008) on lentil and Bradfor *et al.* (1990) on pepper.

Table 1: Effect of hydropriming periods (hrs) on the germination of tomato seeds

Treatments (hours)	2	3	4	5	6	Total %
0	2	11.75b	14	11	1.56b	40.31d
6	2	14.0a	14	13	13.5a	56.50a
12	1.25	14.40a	13.5	8.75	11.75a	49.65c
24	3	10.75b	14.2	12	10.40a	50.35b
Significant	Ns	*	ns	Ns	*	*
SE±		0.75	ns	Ns	1.95	1.24

Means with different letter(s) in the same column are significantly different at ($P<0.05$) probability level.

The emergence of tomato seedlings was significantly ($P<O.05$) affected by hydro priming periods, with twelve hours priming having the highest seedlings emergence over other treatments (0 and 24 hours) priming duration. The longest emergence time was recorded in control seeds (Table 2). The reduction in the time taken by seedlings to emerge as a result of priming treatments might be due to growth stimulation set up in the germination as reported by Singh *et al*. (2002) where they maintained that in tomato seeds, correcting enzymatic and substrate deficiencies at the initial stage of germination, stimulation of hydrolytic enzymes brings about the breakdown of stored food material and also increased the metabolic activity providing energy to start and sustain embryo growth. The result is also in agreement with the findings of Omran *et al.* (1980) in Bhendi, and Sathish kumar *et al.* (2005) in garden egg.

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Table 2: Effect of hydropriming periods (hrs) on the emergence of tomato seeds

Treatments (hours)	Emergence (days) 4	5	6	Total emergence
0	2.25b	3.5b	5.75bc	11.75c
6	3.25a	1.25b	6.5bc	14.0b
12	4.5a	6.25a	8.0a	18.75a
24	3.75a	4.75a	7.25ab	15.75b
significant	*	**	**	**
SE±	0.27	0.39	0.37	0.65

Means with different letter(s) in the same column are significantly different at ($P<0.05$) probability level.

Among the pre-sowing treatments, 12 and 24 hours of priming recorded significantly ($P<0.05$) higher plant height followed by 6 hours priming at 3 WAS. While at 4 WAS all the treatments except control recorded statistically similar values in terms of plants height. But there was no significant effect of priming on the plant height at 2 WAS. The increased plant height as a result of hydropriming might be attributed to rapid cell division in meristematic region, number of cells and increase in cell elongation due to multiplication of various parts of the plants tissue, increasing photosynthesis as reported by Sadavorthe and Gupta, (1963) and Nalini *et al*. (2001).

Table 3: Effect of hydropriming periods (hrs) on the plant height and drymatter weight of tomato seedlings.

	Plant height (cm)			
Treatments hours)	**2WAS**	**3WAS**	**4WAS**	**Dry mater weight**(g)
0	5.74	14.08c	20.28b	1.68b
6	5.98	16.20b	23.70a	2.0a
12	6.16	17.77a	24.88a	2.18a
24	6.68	17.48a	24.29a	2.0a
Significance	Ns	*	*	*
SE±		0.14	0.52	0.00

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Means with different letter(s) in the same column are significantly different (P<0.05) . WAS Weeks after sowing

Hydropriming was found to affect the dry weight of tomato seedlings significantly (P<0.05). Though all the periods of hydropriming recorded statistically similar weight, they were significantly over and above the control treatment in terms of dry matter weight. This tends to suggest that hydro-priming of tomato seeds has positive effect towards increasing dry matter accumulation in the seedlings. This increase in dry matter weight due to priming treatments might be linked to the vigorous growth exhibited by the primed seedlings which enable them to accumulate more photosynthetes, higher length, leaf number, hence more dry weight. This finding was buttressed by those of many researchers such as Movi *et al.* (2006), Anisa *et al.* (2005). Tavili *et al.* (2010) and Benne (2009) who also reported increase in the dry matter content of primed seeds while working with different crop.

CONCLUSIONS

In this research, seed hydropriming was found to increase germination and other characteristics under study. This might be due to faster water up take by primed seeds compared to the contral. Therefore tomato seeds could be primed for six to twelve hours in order to derive the maximum priming benefits which might translate to higher growth performance hence higher yield.

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