RESPONSE OF MAIZE (*Zea mays L.*) UNEDR SEED PRIMING WITH SPENT WASH AND WATER

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ABSTRACT: *Seed priming is one of the most basic treatments for getting higher seed germination consequently production of the crops. The spent wash is rich in essential nutrients and some plant growth hormones. Therefore, this study has been conducted to evaluate the growth response of maize under seed priming with spent wash & water. The maize seed of Akbar variety was soaked with water and different spent wash concentrations to determine its effect on early seedling growth of maize. The results showed that maximum seed germination (90.15) was obtained under seed priming with water followed by seed sown without priming (81.15). The seed priming with spent wash & water with 50:50 ratios where as seed priming with 100% spent wash adversely affected the germination i.e. 10.18%. The seeds primed with water showed significantly higher traits of evaluation than all other treated seeds.*

Key words: Maize, spent wash, water, priming, germination.

INTRODUCTION

Spent wash is an odorous residual liquid waste released during alcohol production in sugar industries. Despite of containing some heavy metals, it is used as irrigation water for sugarcane crop as it contains all the essential elements required for the crop growth [1]. In recent years, due to expansion of distilleries in the sugarcane growing countries, the indiscriminate disposal of spent wash in sugarcane cultivation lands adjacent to different industries is affected by heavy metal toxicity [2]. Heavy-metal pollutants have a high bioaccumulation rate and they are slowly released in an organism, causing a number of damages. Eco geochemical studies have shown that the highest level of heavy metals (Hg, Pb, Zn, Cu, Cd, Cr, Ni, V, As) was present in soils of territories of industrial enterprises [3]. The biological responses to an external hazardous agent that give a measure of exposure and that can be used to indicate harmful effects or to predict future harm are classified as biomarker [4]. Assays of chromosome aberrations in plants are some of the oldest, simplest, most reliable, and least expensive biomarkers in the field of environmental mutagenesis [5].

Seed priming is a technique in which seeds are either soaked in water or low osmotic potential solution to activate seed germination and its related metabolic activities [6;7;8;9]. Seed priming permits the seed metabolic activities without these activities germination reduces. This prevents the seeds absorb enough water for water projection suspending in lag phase [10]. An attempt has therefore been made in the present study to unearth the consequences of distillery spent wash on maize .This study also presents an overview of the problems caused by distillery spent wash after the maize seed soaked in different concentrations.

METHODOLOGY

The research study was carried out in the laboratory, department of Agronomy, Sindh Agriculture University Tando Jam, Pakistan. The maize *(Zea mays L.)* seed variety Akbar was obtained from the Sindh Agriculture Research Tando Jam whereas the un-distilled spent wash was obtained from Mirpurkhas Sugar Mills (Pvt.) Ltd. The experiment was carried out in completely randomized design (CRD) included three replications with four treatments, these were T1 = Control (unprimed/un-soaked), T2 = Seed priming with drinking water, T3= Seed priming with Water + Spent Wash 50:50 and T4 = Seed Priming with 100% un-distilled spent wash. The seed was primed for two hours under all treatments and then it was sown in Petri dishes separately for each environmental condition (treatments). The data was collected for seed germination%, shoot-root length, shoot-root fresh weight and shoot-root dry weight and then statistically analyzed after getting the raw data with MSTAT-C. The details of observations are as under:

RESULT

Germination % of Maize as affected by different priming sources

The results for germination % as affected by different seed priming sources presented in table-1.

The results showed that the seed priming sources significantly affected on seed germination percentage of maize. The table showed maximum seed germination % (90.15) seed priming with water followed by 81.15 was observed at without priming whereas seeds treated with 50/50% water and un-distilled spent was showed 51.22 seed germination % further results indicated that the 100% un-distilled spent wash adversely affect on seed germination% found as 10.18 respectively.

Table-1:Germination % of Maize affected by different priming sources

Treatments	Germination%
T1 = Control (unprimed/un-soaked)	81.15 B
T2 = Seed priming with drinking water	90.15 A
T3= Seed priming with Water + Spent Wash 50:50	51.22 C
T4 = Seed Priming with 100% un-distilled spent wash	10.18 D

SE = 0.5851, LSD 5% 2.025

Shoot length of maize as affected by different priming sources

The results for shoot length of Maize as affected by different seed priming sources are presented in table 2. The results showed that the seed priming sources significantly affected on Shoot Length of maize. The table showed maximum shoot length 23.37 obtained from seed priming with water, followed by 20.83 was observed at without priming whereas seeds treated with 50/50% water and un-distilled spent was showed 19.10 , further results indicated that the 100% un-distilled spent wash adversely affect on Shoot Length found as 15.05 respectively.

Table -2: Shoot length of maize as affected by different priming sources

Treatments	Shoot length
T1 = Control (unprimed/un-soaked)	20.83 B
T2 = Seed Priming with drinking Water	23.37 A
T3= Seed Priming with Water +Spent Wash 50:50	19.10 C
T4 = Seed Priming with 100% un-distilled spent wash	15.05 D

SE = 0.3302, LSD 5% 1.142

Root length of maize as affected by different priming sources

The results for root length as affected by different seed priming sources presented in table 3.

The results showed that the seed priming sources significantly affected on Root Length of maize. The table showed maximum shoot length 14.10 obtained from seed priming with water, followed by 11.34 was observed at without priming whereas seeds treated with 50/50% water and un-distilled spent was showed 10.51 further results indicated that the 100% un-distilled spent wash adversely affect on root length 8.093 respectively.

Table -3 Root length of maize as affected by different priming sources

Treatments	Root length
T1 = Control (unprimed/un-soaked)	11.34 B
T2 = Seed Priming with drinking Water	14.10 A
T3= Seed Priming with Water + Spent Wash 50:50	10.51 C
T4 = Seed Priming with 100% un-distilled spent wash	8.093 D

SE = 0.1538, LSD 5% 0.5324

Shoot Fresh Weight of Maize as affected by different Priming sources

The results for shoot fresh weight as affected by different seed priming sources presented in table 4 its analysis for variance presented in appendix-4.

The results showed that the seed priming sources significantly affected on Shoot Fresh Weight of maize. The table showed shoot length 3.177 was obtained from seed without priming with water followed by 3.257 was observed at priming with water whereas seeds treated with 50/50% water and un-distilled spent was showed 2.900 , further results indicated that the 100% un-distilled spent wash adversely affect on Shoot fresh weight found as 0.4633 respectively.

Table-4: Shoot Fresh Weight of Maize as affected by different Priming sources

Treatments	Shoot fresh weight
T1 = Control (unprimed/un-soaked)	3.177 A
T2 = Seed Priming with drinking Water	3.257 AB
T3= Seed Priming with Water + Spent Wash 50:50	2.900 B
T4 = Seed Priming with 100% un-distilled spent wash	0.4633 C

SE = 0.1095, LSD 5% 0.3791

The root fresh weight of maize as affected by different priming sources

The results for root fresh weight as affected by different seed priming sources presented in table 5 its analysis for variance presented in Appendix-5.

The results showed that the seed priming sources significantly affected the root fresh weight of maize. The table showed maximum root fresh weight 2.627 was obtained from seed without priming with water, followed by 1.660 was observed at priming with water whereas seeds treated with 50/50% water and un-distilled spent was showed 1.610 , further results indicated that the 100% un-distilled spent wash adversely affect on Root Fresh Weight found as 0.2400 respectively.

Table–5: Root fresh weight of maize as affected by different priming sources

Treatments	Root fresh weight
T1 = Control (unprimed/un-soaked)	1.660 B
T2 = Seed Priming with drinking Water	2.627 A
T3= Seed Priming with Water + Spent Wash 50:50	1.610 B
T4 = Seed Priming with 100% undistilled spent wash	0.2400 C

SE = 0.1304, LSD 5% 0.4512

Shoot dry weight of maize as affected by different priming sources

The results for shoot dry weight as affected by different seed priming sources presented in table 6 its analysis for variance presented in appendix-6.

The results showed that the seed priming sources significantly affected on shoot dry weight of maize. The table showed maximum shoot dry weight 0.3470 was obtained from seed without priming with water followed by 0.3080 was observed at priming with water whereas seeds treated with 50/50% water and un-distilled spent was showed 0.2900, further results indicated that the 100% un-distilled spent wash adversely affect on Shoot dry weight found as 0.4633 respectively.

Table–6: Shoot dry weight of maize as affected by fferent priming sources

Treatments	Shoot dry weight
T1 = Control (unprimed/un-soaked)	0.3080 B
T2 = Seed Priming wit h drinking water	0.3470 A
T3= Seed Priming with Water and Spent Wash 50:50	0.2900 B
T4 = Seed Priming with 100% un-distilled spent wash	0.04333 C

SE = 0.005774, LSD 5% 0.01998

Root dry weight of maize as affected by different priming sources

The results for root dry weight as affected by different seed priming sources presented in table 7 its analysis for variance presented in appendix-7.

The results showed that the seed priming sources significantly affected on Root Dry Weight of maize. The table showed maximum root dry Weight 0.2440 was obtained from seed priming with water followed by 0.2080 was observed at seed without any treatment whereas seeds treated with 50/50% water and un-distilled spent was showed 0.1780 , further results indicated that the 100% un-distilled spent wash adversely affect on root dry weight found as 0.0333 respectively.

Table–7: Root dry weight of maize as affected by different priming sources

Treatments	Root dry weight
T1 = Control (unprimed/un-soaked)	0.2080 B
T2 = Seed Priming with drinking water	0.2440 A
T3= Seed Priming with Water + Spent Wash 50:50	0.1780 C
T4 = Seed Priming with 100% un-distilled spent wash	0.03333 D

SE = 0.005774, LSD 5% 0.0199

DISCUSSION

Seed priming is an efficient way to improve seed germination percentage as well as seedling establishment. It is an easy and low cost technique even free with water to overcome the crop production issue. Therefore, this study has been conducted to give some important fresh recommendations to end-users (real farmers). It has been recorded that seed priming with water resulted maximum germination. In terms of shoot length, the seeds primed with water showed largest shoot length. These findings are in similarity with those of [11] Berhanu and Gebremedhn, they also recorded that water primed seed of the maize got higher shoot length even under saline conditions. In case of other maize growth parameters, mostly seeds primed with water performed well. These were looking always fresh, stronger-upward and standing straight. These all findings regarding comparatively better growth parameters under water priming are in agreement with those of [12] Giri and Schillinger and [13] Snapp et al., and [11] Berhanu and Gebremedhn). They all different scientists also recorded that maize seeds primed with water showed higher growth parameters.

CONCLUSION:

Our study concludes as well as recommends that water seed priming showed maximum seed germination and seedling establishment of maize. However, increased concentration of un-distilled spent wash negatively affected upon both seed germination and maize seedling establishment.

REFERENCES

[1] Jain, R., H.N. Shahi, S.Srivastava and V.K. Madan. "Impact of distillery effluents on growth attributes, chlorophyll content and enzymatic activity of sugarcane." *Proc.24th ISSCT Conf., Brisbane, Australia*. 155-157 (2001)

[2] Om, H., Singh and M.S.Arya. "Combined effect of wastes of distillery and sugar mill on seed germination, seedling growth and biomass of okra (Abelmoschus esculentus L. Moench)." *J. Environ. Biol.* **15**:171-175 (1994)

[3] Taragkevieius, R. "Pedogeochemical investigations of heavy metal concentration in Vilnius urban environment. In: Heavy Metals in the Environment: An Integrated Approach". *D.A. Lovejoy. Vilnius,* 154-157 (1999)

[4] Earnst, WHO and P.J. Peterson. "The role of biomarkers in environmental assessment." *Terrestrial plants. Ecotoxicol.*, **3**:180-192 (1994).

[5] Constantin, M.J and E.T. "Owens: Introduction and perspective of plant genetic and cytogenetic assays." *Mutate Res*, **99**: 37-49 (1982)

[6] Heydecker W, Coolbear P. "Seed treatments for improved performance survey and attempted Prognosis". *Seed SciTechnol* **5**: 353-425 (1977)

[7] Bradford K.J. "Manipulation of seed water relations via osmotic priming to improve germination under stress conditions." *HortSci.*, 21: 1105-1112 (1986)

[8] McDonald M.B. Black M., Bewley J.D. "Seed priming: Seed technology and its biological basis." *Sheffield Academic Press Ltd., Sheffield, UK,* 287-325 (2000)

[9] Farooq M., Basra S.M.A., Khan M.B. "Seed priming improves growth of nursery seedlings and yield of transplanted rice." *Arch. Agron. Soil Sci*., **53**: 311-322 (2007)

[10] Taylor, A.G., D.E. Klein and T.H. Whitlow. "Solid matrix priming." *ScientiaHort*, **37**: 1 -11 (1998)

[11] Berhanu Abraha, Gebremedhn Yohannes. "The role of seed priming in improving seedling growth of maize (Zea maysL.) under salt stress at field conditions." *Agricultural Sciences*. **4**(12): 666-672. (2013)

[12] Giri, G.S. and W.F. Schillinger. "Seed priming winter wheat for germination emergence and yield." *Crop Science*, **43**: 2135-2141 (2003)

[13] Snapp, S., R. Price and M. Morton. "Seed priming of winter annual cover crops improves germination and Emergence." *Agron. J.*, **100**: 1506-1510 (2008)