EFFECT OF SEED PRIMING AND WEED MANAGEMENT ON LENTIL UNDER RAINFED CONDITION OF PESHAWAR

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Abstract- *A field experiment "Effect of seed priming and weed management on lentil under rainfed condition of Peshawar" was conducted at Agriculture University Peshawar, during rabi 2018-19. The study was carried out in RCB design with three replications. Markaz-9 lentil variety was used. The size of the plot was 1.2 x 2.5 m with row to row distance of 30 cm. Seed priming and weed management had significant effect on emergence m^{-2}, number of pods $plant^{-1}$, biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}) of lentil crop while effect of seed priming and weed management on number of seeds pod^{-1} was non-significant. Seed priming (SP) with KNO_3 had significantly more number of pods $plant^{-1}$ (25.5), control had biological yield kg ha^{-1} (1927.2) and hydro-priming had grain yield kg ha^{-1}(628.7). Weed management (WM) with weeding at 30 days after sowing (DAS) had significantly more number of pods $plant^{-1}$ (27.7) and plant height (43.8 cm) while mulching have higher biological yield kg ha^{-1}(2049.6) and grain yield kg ha^{-1}(614.4). Water treatment and mulching had significantly increased all these parameters. Hydro-priming with mulching recommended for lentil under the rainfed condition of Peshawar.*

Index Terms- *Seed priming, Weeds management, lentil yield and their components*

I. Introduction

Lentil (Lens culinaris ssp. culinaris) is an important food legume with various uses as food and feed because of its protein-rich grains and straw. Globally, it is cultivated as a rainfed crop on 3.85 million hectares (m ha) area with 3.59 million tones production Erskine et al. (2011).

The major geographical regions of lentil production are South Asia and China (44.3%), North America (41%), Central and West Asia and North Africa i.e. CWANA (6.7%), Sub-Saharan Africa (3.5%) and Australia (2.5%).

Morocco as main producers grows winter and spring planted lentil on 0.59 m hectare area with 0.48 million tones production. In the Sub-Saharan Africa, Ethiopia is the major producer with 0.11 MT lentil. India is the second largest producer of lentil in the world after Canada with a total production of 1.03 million tons (Kumar et al., 2013).

Pakistan is one of the major lentil growing countries of south Asia. It is grown as a winter crop on an area of about 18.2 million hectare with a total production of 8.1 million tons annually. In Sindh, lentil is an important winter pulse crop grown on an area of about 1.5 million hectare, with an annual production of 0.9 million tons and grain yield of about 600 kg ha^{-1}. In Punjab, area of lentil is about 11.5 million hectare, with an annual production of 4.3 million tons and grain yield of about 374 kg ha^{-1}. In Khyber Pakhtunkhwa (KP), lentil crop grown on an area of about 3.4 million hectare, with an annual production of 1.7 million tons and average grain yield of about 500 kg ha^{-1} (NFS&R, 2013-14).

Lentil does not tolerate water-logging at germination compared to cereals, and vegetative growth and roots are severely depressed by water-logging after emergence. Water-logging can reduce lentil yields at any time during the growing season especially in lower lying areas or on poorly structured soils where drainage is impeded.

Weed management aims to reduce the overall number of weeds competing with the crop and, in some cases; target particular 'hard to manage' weeds such as herbicide resistant ryegrass. Crop rotations should consider crops that provide opportunities for weed control required in each paddock. Crop rotation should also allow for rotation of herbicide groups to minimize the build-up of herbicide resistance (GRDC, 2017). Good agronomic practice results in a more competitive crop. Using weed-free seed (preferably registered or certified), sowing on time, optimal plant populations and adequate nutrition all contribute to good weed control. All weeds growing in a paddock should be controlled before the crop emerges. Large, advanced weeds not controlled prior to or during sowing are the most difficult, and often impossible, to control with in-crop herbicides (GRDC, 2017).

Weeds should be removed from crops early, and certainly no later than six weeks after sowing, to minimize yield losses. Yield responses depend on weed species, weed, and crop density and seasonal conditions (GRDC, 2017).

Agricultural management practices can change the characteristics of the soil surface and influence the hydrothermal properties of the soil. For example, mulching can affect the temperature and moisture content of the soil and directly influence the grain yield of crops (Aminiand Milani., 2013).

Straw mulching systems can conserve soil water and reduce temperature because they reduce soil disturbance and increase residue accumulation at the soil surface Aminiand Milani (2013).

Soil mulching with plastic film, which results in reduced water loss and more even regulation of soil temperature, has been widely used in agriculture. Supplementary irrigation would improve plant water relation as well as grain yield. However, a high crop yield is not the only goal, other constraints such as water availability and the costs of irrigation also need to be taken into account in the management (Aminiand Milani., 2013).

Seed priming is a technology through which substantial yield improvement can be achieved. Seed priming is a technique in which seed is soaked in water overnight prior to sowing. This is generally done to hasten germination, especially in cool temperatures and dry soils. Priming of seeds enhances germination by inducing biochemical changes in the seed. Seed priming prior to planting increased yields by 29 – 38% in different agro-ecological conditions (GRDC, 2017).

It is widely accepted that soaking is a simple and inexpensive technique of achieving desirable changes in the nutritional quality of legume seeds. Some authors have reported that soaking improves the quality of legumes because of the reduction of some water-soluble anti-nutritional factors however, as a result of the water uptake; the nutrient content of legumes can also be affected by leaching of hydro-soluble compounds from the legumes into the water (GRDC, 2017).

II. IDENTIFY, RESEARCH AND COLLECT IDEA

An experiment "Effect of weed management and seed priming on lentil under rainfed condition of Peshawar" was conducted at Agronomy Research Farm, University of Agriculture Peshawar, during Rabi 2018-2019. Weed management (WM) i.e. Mulching, No mulching, No weeding, Weeding 30 days after sowing (DAS), Weeding 60 DAS and seed priming (SP) with NaCl solution at the rate of 04 gram per liter of water, KNO_3 solution at the rate of 10 gram per liter of water, hydro-priming and non-primed (dry seed). All the seeds then were dried before sowing. Markaz-9 variety was used. The experiment was laid out in randomize complete block design with three replications. The size of the plot was 2.5 x 1.2 m with row to row distance of 30 cm. The seed used at rate of 50 kg ha^{-1}. Nitrogen was applied at the rate of 30 kg ha^{-1}. All agronomic practices were carried out uniformly throughout the experiment.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

Results and discussion

Data concern with emergence (m^{-2}), plant height (cm) and number of pods $plant^{-1}$ is shown in Table 1. Mean value of data revealed that emergence (m^{-2}) was significantly affected by both seed priming and weed management. While interactive effect of seed priming and weed management were found non-significant. Significantly more emergence m^{-2} (208.1) was recorded in plots with hydro-priming while minimum seedling emergence m^{-2} (183.2) was recorded in NaCl soaking. Similarly more seedling emergence m^{-2} (210.2) was recorded in plots with mulching while minimum seedling emergence m^{-2} (179.6) was recorded in no mulching plots. These results are in line with those of Toklu (2015) who concluded that the hydro-primed seeds treatment resulted in increased seedling, root number and length. These result also similar with Lhungdim et al. (2014) who conducted experiment to investigate the germination potential, seedling vigor and yield of lentil (Lens culinaris, Medik.) var 'PL-4' against three seed rates with hydro-primed and osmo-primed. Highest germination rate was reflected with hydro priming which was significantly superior to other priming methods. Mean value of the data showed that taller plant (43.7 cm) were obtained from plots treated with water followed seed treatment with KNO_3 which give plant height (42.5 cm) and minimum plant height (39.2 cm) were recorded in control plots. Weed management had significantly affected plant height. Significantly taller plant (45.2 cm) were obtained from mulching plots followed plots with weed management at 30 DAS which give plant height (43.8 cm) and minimum plant height (35.5 cm) were recorded in no mulching plots. These result also similar with those of Erman et al. (2004) who concluded that prometryn, hand hoeing, linuron (with or without hand hoeing) resulted in the highest plant height, yield and best weed control in winter lentil. Therefore, any one of these treatments can be recommended for the control of weeds in winter lentil production. Mean data revealed that seed priming had not significantly affected number of pods plant^{-1}. KNO_3 soaking produce significantly more number of pods palnt^{-1} (25.5) followed by water and NaCl soaking plots. Weed management had significantly affect number of pods plant^{-1}. Plots with 30 DAS produce significantly more number of pods palnt^{-1}(27.7) followed by rest of the plots, while significantly lower number of pods plant^{-1} (20.0) were produce by lentil crop on no mulching plots. These results are in line with Singh et al. (2018) who evaluated that the improvement in yield of lentil under weed management treatment might be due to favorable growth and yield contributing characters (plant height, number of branches plant^{-1}, number of pod plant^{-1}, seed weight and reduction in weed infestation after spray of herbicides as reflected by weed control efficiency of herbicides.

Table 1. Emergence m^{-2}, plant height (cm) and number of pods plant^{-1} of lentil as affected by seed priming and weed management.

Seed Priming (SP)	Emergence (m^{-2})	Plant height (cm)	Number of pod plant^{-1}
Control	196.8 ab	39.2 b	23.2 a
Water soaking	208.1 a	43.7 a	22.3 a
KNO_3 soaking	189.9 b	42.5 ab	25.5 a
NaCl Soaking	183.2 b	42.0 ab	22.3 a
LSD (0.05)/Significance	16.0	4.2	5.05
Weed Management (WM)			
Mulching	210.2 a	45.2 a	22.4 b
No Mulching	179.6 c	35.5 b	20.0 b
No weeding	197.3 ab	42.8 a	23.3 ab
Weeding 30 DAS	191.0 bc	43.8 a	27.7 a
LSD (0.05)/Significance	16.0	4.2	5.05
Interaction	NS	NS	NS

Data concern with biological yield (kg ha^{-1}) and grain yield (kg ha^{-1}) are shown in Table 2. Mean value of the data showed that different seed priming had significantly affected biological yield (kg ha^{-1}). Significantly greater biological yield (1927.2 kg ha^{-1}) was obtained from control plots followed by seed treatment with water (1911.1 kg ha^{-1}) and minimum biological yield (1841.2 kg ha^{-1}) was recorded in NaCl priming. Similarly greater biological yield (2049.6 kg ha^{-1}) was obtained from mulching plots followed by weed management at 30 DAS (1893.3 kg ha^{-1}) and minimum biological yield (1666.7 and 1668.2 kg ha^{-1} respectively) were recorded in control plots while interaction between seed priming and weed management was found non-significant. These results are similar to those of Golezani et al. (2012) who evaluated the effects of hydro-priming duration (P_1, P_2 and P_3: 0, 8 and 16 h, respectively) on field performance of lentil under different irrigation treatments. Analysis of variance of the data for yield and yield components showed that plant height, biological yield, grain yield plant^{-1} and harvest index were significantly affected by irrigation and hydro-priming duration. These results are also in line with those of Elkoca et al. (2005) who recorded the density and dry weight of weed species, density of lentil, seed yield, total crop biomass yield, and harvest index. Weed control applications significantly decreased density and dry weight of weeds and increased total crop biomass and seed yields. Mean value of data showed that different seed priming and weed management had significantly effect on grain yield (kg ha^{-1}). From the mean data it is cleared that maximum grain yield (628.7 kg ha^{-1}) were recorded with hydro-priming followed by seed treatment with KNO_3 (556.6 kg ha^{-1}) and minimum grain yield (462.8 kg ha^{-1}) was obtained from control plots. Mean value of data also showed that maximum grain yield (614.4 kg ha^{-1}) were recorded with mulching followed by weed management at 30 DAS (549.4 kg ha^{-1}) and minimum grain yield (452.2 kg ha^{-1}) was obtained from no mulching plots while the interaction between seed priming and weed management was found non-significant. These results are in line with those of Golezani et al. (2013) who observed that hydro-priming treatments to lentil seeds increased the plant height, number of pods and number of seeds plant^{-1}, 1,000 grain weight, biological yield, grain yield and the harvest index when compared to the control.

Table 2. Biological yield (kg ha^{-1}), and grain yield (kg ha^{-1}) of lentil as affected by seed priming and weed management.

Seed Priming (SP)	Biological yield (kg ha^{-1})	Grains yield (kg ha^{-1})
Control	1927.2 a	462.8 b
Water soaking	1911.1 a	628.7 a
KNO_3 soaking	1598.4 b	556.6 ab
NaCl Soaking	1841.2 ab	516.2 b
LSD (0.05)/Significance	253.21	111.54
Weed Management (WM)		
Mulching	2049.6 a	614.4 a
No Mulching	1666.7 b	452.2 b
No weeding	1668.2 b	548.2 ab
Weeding 30 DAS	1893.3 ab	549.4 ab

LSD (0.05)/Significance	253.21	111.54
Interaction	NS	NS

IV. CONCLUSION

It is concluded from the experiment that seed priming with KNO_3 had significantly more number of pods plant^{-1} (25.5), control had biological yield kg ha^{-1} (1927.2) and hydro-priming or water soaking had grain yield kg ha^{-1}(628.7). Weed management with weeding at 30 days after sowing had significantly more number of pods plant^{-1} (27.7) and plant height (43.8 cm) while mulching have higher biological yield kg ha^{-1}(2049.6) and grain yield kg ha^{-1}(614.4). It is recommended that water soaking and mulching increased all these parameters which were studied in the research and recommended for the rainfed condition of Peshawar.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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