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EFFECT OF HYDROGEL ON GROWTH, YIELD AND WATER USE EFFICIENCY IN PEARLMILLET (*PENNISETUM GLAUCUM)* PRODUCTION

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SUMMARY

A field experiment was conducted at Agricultural Research Station, Fatehpur-Shekhawati in three consecutive rainy (**kharif***)* seasons of 2006-08) to study the effect of hydrogel on yield and water use efficiency in pearlmillet. The soil of the experimental field was sandy loam, low in available nitrogen (168 kg/ha), medium in available phosphorus (21 kg/ha) and high in available potash (301 kg/ha) with 0.46 per cent organic carbon and alkaline (pH 8.2) in reaction. The experiment consisting of six treatments was conducted in randomized block design with four replications. The study revealed that effective tillers/ plant, ear length, grain weight/earhead and test weight were significantly influenced by seed treatment with hydrogel. The grain, stover yield and WUE were also significantly influenced by the hydrogel application. The highest increase in grain yield was noted with seed coating with 20 g hydrogel+TU+DMSO followed by 20 g hydrogel, 10 g hydrogel+TU+DMSO and 10 g hydrogel per kg seed.

Key words : Hydrogel, geowth, yield, WUE, pearl millet

Pearl millet (*Pennisetum glaucum* L.) is the fourth most important cereal after rice, wheat and maize in India. It is the staple food for millions of people in the semi-arid tropics. Rajasthan stands first in production but productivity is only 431 kg/ha which is quite low as compared to national productivity of 732 kg/ha. Pearlmillet survives in rainfed areas because of its drought escaping mechanism but still responds well to all inputs including fertilizers. Soil moisture is the most important factor for successful crop production in dry lands. Under rainfed situation, risk of crop failure does not permit the farmers to apply recommended dose of chemical fertilizer and other inputs. Supplemental irrigation at critical growth stage with harvested rain water can increase water use efficiency (WUE) over that of rain fed crop but where rain water collection is not possible due to less runoff (combined effect of low rain intensity and high infiltration rate), the water absorbing products like hydrogel may be used as soil amendment (Singh and Naga, 2006). Keeping this in view, an experiment was conducted to study the role of hydrogel in improving water conservation and water use efficiency in pearlmillet.

MATERIALS AND METHODS

The field experiment was conducted at Agricultural Research Station, Fatehpur-Shekhawati in three consecutive rainy (**kharif***)* seasons of 2006-08. The soil of the experimental field was sandy loam, low in available nitrogen (168 kg/ha), medium in available phosphorus (21 kg/ha) and high in available potash (301 kg/ha) with 0.46 per cent organic carbon content and alkaline (pH 8.2) in reaction. The experiment consisting of six treatments (Table 1) was conducted in randomized block design with four replications. Seed soaking in water, thiourea (500 ppm) and DMSO (100 ppm) was done for 5-6 h and then dried in shade and treated with hydrogel before sowing. Pearlmillet variety ICMH-356 was sown in 45 cm row spacing and recommended dose of fertilizers and other cultivation practices were adopted. The rainfall received during the growing period (June to September) was 200.8 mm in 2006, 324.8 mm in 2007 and 498.2 mm in 2008. Seasonal consumptive use of water by the crop for the entire growing season was estimated from total soil-moisture depletion by soil-moisture determination (Dastane, 1972).

TABLE 1

Effect of seed coating with gamma hydrogel on yield attributing characters, yield and WUE of pearl millet production (Pooled data 2006-08)

S. No.	Treatment	Effective tilelrs/ plant	Ear length (cm)	Grain weight/ ear (g)	Test weight (g)	Grain yield (q/ha)	Stover yield (q/ha)	Consumptive use of water (mm)	WUE (kg/ha-mm)
1.	Control	1.29	21.5	12.51	6.91	17.89	44.06	210.2	8.51
2.	Water soaking	1.31	21.8	12.73	6.98	18.15	45.27	212.0	8.56
3.	Seed coating with 10 gm hydrogel/kg seed	1.39	22.9	14.19	7.83	20.00	47.91	225.7	8.86
4.	Seed coating with 20 gm hydrogel/kg seed	1.43	23.7	14.90	8.21	21.39	50.67	231.4	9.24
5.	Seed coating with 10 gm hydrogel+TU (0.1%)+ DMSO (0.01%)/kg seed	1.42	23.5	14.54	8.00	20.95	49.60	226.3	9.26
6.	Seed coating with 20 gm hydrogel+TU (0.1%)+ DMSO (0.01%)/kg seed	1.50	24.3	15.42	8.42	22.06	51.56	237.6	9.28
	S. Em±	0.04	0.5	0.31	0.12	0.63	1.53	-	-
	C. D. (P=0.05)	0.12	1.4	0.89	0.35	1.84	4.45	-	-

TU–Thiourea, DMSO–Dimethyl sulphoxide, WUE–Water use efficiency.

RESULTS AND DISCUSSION

Yield Attributes and Crop Yield

Crop yield attributes viz., effective tillers/plant, ear length, grain weight/ear- head and test weight were significantly influenced by seed treatment with hydrogel (Table 1). The maximum increase in number of effective tillers per plant, ear length, grain weight/earhead and test weight were observed with seed coating by 20 g hydrogel+TU+DMSO followed by 20 g hydrogel and 10 g hydrogel+TU+DMSO per kg seed and were found significantly superior over control, though the differences among the hydrogel levels were non-significant.

The grain and stover yields were also significantly influenced by the hydrogel application (Table 1). The highest increase in grain yield was noted with seed coating 20 g hydrogel+TU+DMSO followed by 20 g hydrogel, 10 g hydrogel+TU+DMSO and 10 g hydrogel per kg over untreated control. The respective increase was of the order of 23.30, 19.56, 17.10 and 11.79 per cent over control. Likewise, the maximum stover yield was observed with 20 g hydrogel+ TU+DMSO followed by 20 g hydrogel and 10 g hydrogel+TU+DMSO per kg over untreated control. The increase in the crop yield parameters and crop yield might be due to the fact that hydrogel application increased the availability of water in root zone at early stage of crop. Hydrogels when hydrated transformed themselves into water-laden gel 'chunks' and these gel chunks acted as local water reservoirs which perhaps helped in initial establishment of crop and resulted in better crop growth. Kant et *al*., (2008) also reported the improvement in crop parameters under water stress conditions with the application of hydrogel substract in bean.

Water Use Efficiency

The maximum water use efficiency (WUE) was noted with seed coating 20 g hydrogel+TU+DMSO followed by 20 g hydrogel, 10 g hydrogel+TU+DMSO and 10 g hydrogel per kg over untreated control. This increased value of WUE might be ascribed to higher grain yield coupled with more proportionate increase in grain yield compared to consumptive use of water.

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