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Theme 2. Grassland production and utilization

Sub-theme 2.7. Seed production, storage, availability and quality

Effect of pretreatments on seed dormancy and seedling growth in Anjan grass (*Cenchrus ciliaris*)

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Introduction

Anjan grass (*Cenchrus ciliaris* L.) is native to tropical, sub-tropical Asia and Africa. It can grow on wide range of soils varying from sandy to harder heavy textured soils with annual rainfall of 350- 800 mm and up to an altitude of 1000 m. Among different rangeland grasses, it is considered palatable and nutritious grass for all kinds of grazing animals. It contains high percentage of protein (8-10%). One of the reasons for low production of pasture is poor plant density which might be due to low seed germination. The seed dormancy in range grasses hampers in establishment of pastures. Dormancy is the state in which a viable seed does not germinate, although placed in conditions of moisture, temperature, light and oxygen concentration appropriate to do so. Germination of freshly harvested seed of *Cenchrus* grass is very low without any treatment but it starts to increase after 6 month of harvesting up to 18 months. Germination (minimum) standard for foundation and certified seed in anjan grass is 30%. Application of some physical, chemical and mechanical treatments to the seed are helpful in overcoming the dormancy. Therefore, the present study was undertaken to determine the effect of pre soaking treatments on germination and seedling parameters of fresh seed of *C. ciliaris*. It will help for evaluating the seed lot for germination before six month of harvest.

Materials and Methods

Present study was undertaken in the laboratory at Western Regional Research Station (Indian Grassland and Fodder Research Institute), Avikanagar (Rajasthan). One month old seed (spikelets) of *C. ciliaris* variety IGFRI-3108 harvested during September, 2014 was used in the study. The proportion of filled seed was observed 62.7 % of this seed lot evaluated under soft X-ray scanning at IARI Regional Station, Karnal. Seed were exposed to pretreatments *viz.* soaking in distilled water using 1:5 (w/v) ratio; soaking in KNO₃ (0.2, 0.4 & 0.6 %); Thiourea (0.2, 0.4 & 0.6 %) and GA₃ (100, 200 & 300 ppm) to study their effects on germination. Seed without any treatment was taken as one control while soaking in distilled water is used another control. The seed was put in the dark in the BOD incubator at 25°C for 6, 12, 18 and 24 hours. Then they were removed from solution and given 3 surface washings with distilled water, and dried under room condition to their original weight and used for germination. The experiment was conducted with a Completely Randomized Design with four replications. 100 seed (spikelets) from each treatment for each replication were put between the papers (BP) and placed in the germinator in the dark at 25°C for 10 days. Number of normal seedlings was expressed as germination per cent. Five normal seedlings were randomly selected for observing seedling length (cm).

Results and Discussion

Enhancement of germination: Analysis of variance revealed that germination percentage increased significantly with pretreatment of all plant growth promoters under study over control as well as pretreatment with distilled water. Among the pretreatments GA₃ found most effective for enhancing germination. Pretreatment with GA₃ (200 ppm) for 24 hr or GA₃ (300 ppm) for 18 hr was equally effective. Highest germination (44.8 %) was recorded with pretreatment with GA₃ (200 ppm) for 24 hours as compared to 12.8 % in control and 18.0 % in distilled water. Significant interaction effect was observed for concentration of GA₃ and duration of pretreatment. Pretreatment effect of KNO₃ (0.6%) and Thiourea (0.4%) for 18 hr gave 26.5% and 27.3% germination, respectively which was also significantly higher as compared to soaking in distilled water (16.5 %) and control but significantly lower than GA₃ (100 ppm) for 12 hr. In general higher concentration of growth promoters for 24 hr showed negative effect on germination (Table 1). Pandeya *and jayam* (1978) studied effect of various growth hormones and chemicals on germination in *C. ciliaris* and reported that 50 ppm GA₃ increased germinability in spikelets of all 11 ecotypes and higher concentrations had retarding effect in varying genotypes. Qadir *et al.*, (2011) reported that priming with 10 or 50 mM KNO₃ for 24 hours improved germination in buffel grass as compared to other pretreatments.

Seedling growth: All pretreatments under study showed significant increment for seedling length and seedling dry weight. Seedling length was recorded 12 cm with GA₃ (200 ppm) at 24 hr, 12.1 cm with Thiourea (0.6%) for 18 hr and 11.9 cm with KNO₃ (0.4%) for 24 hr which were equally effective as compared to 10.0 cm in control and 10.7 cm in distilled water for 24 hr. Effect of pretreatment duration was non significant between 24 and 18 hr while, these both were significantly higher over 6 and 12 hr (Table). Shanmugavalli *et. al.* (2007) reported that pretreatment with GA₃ (200 ppm) solution for 24 hours significantly increased seedling length over other treatments in fodder sorghum.

Table 1: Response of different seed soaking treatments on germination and seedling growth in *C. ciliaris* (var. IGFRI-3108)

Treatment/ Duration	Germination %					Seedling length (cm)				
	6 hr	12 hr	18 hr	24 hr	Mean	6 hr	12 hr	18 hr	24 hr	Mean
Distil water	13.0	14.8	16.5	18.0	15.6g	10.2	10.4	10.6	10.7	10.5d
KNO ₃ (0.2%)	13.0	16.0	18.0	19.3	16.6g	10.6	11.0	11.3	11.5	11.1bc
KNO ₃ (0.4%)	15.3	19.3	20.8	23.3	19.6f	10.8	11.2	11.7	11.9	11.4abc
KNO ₃ (0.6%)	18.8	22.5	26.5	23.8	22.9e	10.9	11.5	11.8	11.7	11.5ab
Thiourea (0.2%)	14.3	18.8	22.5	27.3	20.7f	10.5	10.8	11.1	11.4	10.9cd
Thiourea (0.4%)	16.8	22.0	27.3	29.5	23.9de	10.7	11.2	11.6	11.8	11.3abc
Thiourea (0.6%)	21.3	25.5	27.5	26.8	25.3d	11.2	11.7	12.1	11.9	11.7a
GA ₃ (100 ppm)	27.3	32.0	35.8	38.5	33.4c	10.6	11.1	11.4	11.6	11.2abc
GA ₃ (200 ppm)	30.5	37.5	42.5	44.8	38.8ab	10.8	11.3	11.7	12.0	11.4abc
GA ₃ (300 ppm)	31.5	38.3	44.3	42.5	39.1a	11.4	11.7	11.9	11.7	11.7a
Mean	20.2d	24.7c	28.2ab	29.4a		10.8d	11.2bc	11.5ab	11.6a	
CD at (1%)	1.9 (pretreatments); 1.2 (duration); 3.7 (interaction)					0.5 (pretreatments); 0.3 (duration); NS (interaction)				

Means sharing common letter in a column do not differ significantly at 1%

Conclusion

Pretreatment with GA₃ (200 ppm) for 24 hours or GA₃ (300 ppm) for 18 hours is effective for overcoming dormancy in the fresh seed of anjan grass.

References

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