Effect of dormancy breaking treatments on the caryopses of *Cenchrus glaucus* cv. CO 1

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SUMMARY

Cenchrus is an apomicitic grass species, established from both seed and rooted slips. The freshly harvested *Cenchrus* fluffs without any seed treatment did not germinate due to the inhibitors present in the husk. The caryopses extracted from the fluffs readily germinate with low percentage (62%). When the caryopses were subjected to different pre sowing seed treatments for the duration of 16h, the caryopses soaked in $CuSO_4$ at 50 or 25ppm and ascorbic acid @ 25 ppm registered higher germination percentage (80%) compared to other treatments.

Key words : *Cenchrus glaucus*, Dormancy, Caryopses

Seed dormancy is the natural phenomenon for the survival of grasses in their undisturbed ecosystem. The seed dormancy in forage grasses prevents successful establishment of a new pastures. *Cenchrus* is an apomicitic grass species, established from both seed and rooted slips.

In *Cenchrus glaucus* also seed germination itself is a problem and the freshly harvested fluffs without any treatment did not germinate. Lahiri and Kharabanda (1963) reported that fresh fluffs of both *Cenchrus* and *Lasirus* possessed inhibitors in the husk which prevents germination of fresh fluffs. But Butler (1985) opined that dormancy mechanisms of *C. ciliaris* lies within the caryopses rather than in the associated structures of fluff. More over handling with the fluffs during sowing or transport poses problem due its bulkiness and empty glumes. The results of tetrazolium test also revealed that *C. glaucus* seeds possessed more than 90 per cent viability when it was fresh. Hence, an attempt was made with true seeds or caryopses given with different dormancy breaking treatments on the germination potential of *Cenchrus glaucus* seeds.

MATERIALS AND METHODS

The fluffs were treated with commercial grade sulphuric acid @ 500 ml kg^{-1} of seeds for 15min. and after repeated washings the caryopses were extracted with the help of closely knitted wire mesh sieve. After thorough washing, the seeds were initially dried under fan and subsequently sun dried to bring the seed moisture content to around 10 per cent. Then the seeds were cleaned by blowing the seeds in the air blower at 0.55 mg pressure for 15 min and used for the study. Seeds were graded with BSS 24 x 24 wire mesh sieve. The following treatments were imposed with a soaking period of 16 h.

T_0 - Control , T_1 - Water soaking, T_2 - 1% KNO_3, T_3-2% KNO_3, T_4 - 25 ppm $CuSO_4$, T_5 - 50 ppm $CuSO_4$, T_6 - 25 ppm ascorbic acid, T_7 - 50 ppm ascorbic acid, T_8- 100 ppm GA_3, T_9 - 200 ppm GA_3, T_{10} - 500 ppm GA_3 The experiment was conducted with a CRD design with four replications. The seeds were subjected to germination test on top of the paper media at the temperature of 25^0C and 90 ± 5% RH with the germination period of 14 days (ISTA, 1990). The seeds were evaluated for root and shoot length, dry matter production and vigour index values (Abdul- Baki and Anderson, 1973). Data were analysed following Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

Germination of caryopses extracted from the fluffs without any seed treatment was 62 per cent against nil germination of intact fluffs implies that the spikelet structures surrounding the true seed possessed more inhibitory effect than the internal structures. The seeds soaked in water recorded no significant improvement in germination indicating the absence of water soluble inhibitors in the caryopses (Table 1).

Among the pre sowing treatments, caryopses soaked in $CuSO_4$ at 50 ppm and ascorbic acid at 25 ppm registered the highest germination of 80 per cent. This was followed by soaking seeds in $CuSO_4$ at 25 ppm solution (79%). Similar results were noticed with the true seeds of different ecotypes of *Cenchrus ciliaris* (Pandeya and Pathak, 1978) with ascorbic acid, copper sulphate and streptomycin. Delatorre and Barros (1996) reported that

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Table 1 : Effect of dormancy breaking treatments on seed germination, root and shoot length of seedlings and vigour index of caryopses in *C. glaucus* cv. CO 1

Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index
Control	62 (51.96)	2.16	3.88	313
Water soaking	65 (53.75)	2.29	4.15	354
1% KNO_3	74 (59.39)	2.38	4.29	494
2% KNO_3	62 (51.96)	2.40	4.11	404
25 ppm $CuSO_4$	79 (62.77)	2.56	4.63	568
50 ppm $CuSO_4$	80 (63.67)	2.49	4.72	578
25 ppm ascorbic acid	80 (63.51)	2.77	4.98	619
50 ppm ascorbic acid	70 (56.89)	2.50	4.93	519
100 ppm GA_3	64 (53.15)	2.38	5.71	438
200 ppm GA_3	66 (54.42)	2.48	5.38	440
500ppmGA_3	52 (46.15)	2.66	5.85	357
M	69 (56.15)	2.44	4.78	462
S.E. $\pm$	2.19	0.217	0.339	37.67
C.D. ($P \leq 0.05$)	4.45	NS	0.691	76.64

Figures in parentheses are arc sine values N.S.- Non significant

cadmium, copper and zinc at higher concentrations (10^{-2} M) relieved the physiological dormancy of partially released scarified seeds of *Stylosanthes humilis* and attributed the reason as ethylene production triggered by the free radical formation due to oxireduction reaction by the copper ions.

KNO_3 (1.0 per cent) soaking showed a germination improvement of 19.3 per cent over control. *C. glaucus* seeds are not light requiring, however, they responded to KNO_3 treatment. But higher concentration was less effective than lower concentration. Bhupathi *et al* (1983) reported the best dormancy breaking treatment for *C. ciliaris* as KNO_3 soaking and similar results were reported in guinea grass (Previero *et al*., 1996) and *Cenchrus echinatus* (Martins *et al*., 1997). KNO_3 raises the ambient oxygen levels by making less oxygen available for citric acid cycle (Bewley and Black, 1983). Leadem (1987) concluded that enhanced germination due to KNO_3 was the outcome of quantitative and qualitative shifts in the protein synthesis.

The highest shoot length of the seedlings was registered with GA treated seeds (5.71cm). Basra *et al*. (1990) reported similar results in guinea grass seeds. Gibberilic acid application might have enabled the extra supply of reducing sugars by way of increased rate of starch break down, which resulted in increased growth rate of seedlings (Paleg, 1960). Whalley (1965) showed that the increase consisted primarily of root growth rather than the top growth. But in the present study the shoot length was improved (33.7 per cent over control) rather than the root length of the seedlings compared to other treatments. The vigour index values were also expressed the superiority of $CuSO_4$ and ascorbic acid in relieving the dormancy of seeds.

From the results of present experiment, it could be concluded that dormancy of caryopses of *Cenchrus glaucus* could be relieved by soaking the seeds in $CuSO_4$ @ 50 or 25ppm or ascorbic acid @ 25 ppm for the duration of 16 h.

REFERENCES

Abdul-Baki, A.A. and Anderson, J.D. (1973). Vigour determination in soybean seed by multiple criteria. *Crop Sci.*, **13**: 630-632.

Basra, A.S., Dhillon – Grewal, R., Kapur, A. and Malik, C.P. (1990). Overcoming germination barriers in guinea grass seeds. *Indian J. Pl. Physiol.*, **33**(4): 371-373.

Bewley, J.D. and Black, M. (1983). Physiology and biochemistry of seeds in relation to germination, Berlin Springer - Verlag.

Bhubathi, P., Jacqueline, A., Selvaraj and Ramaswamy, K.R. (1983). A note on seed dormancy in *Cenchrus ciliaris*. *Seed Res.*, **11**(2): 232-234.

Butler, J.E. (1985). Germination of Buffel grass. *Seed Sci. & Techno*l., **13** (2): 583-591.

Delatorre, C.A. and Barros, R.S. (1996). Germination of dormant seeds of *Stylosanthes humilis* as related to heavy metal ions. *Biol. Plantarum*, **38**(2): 269-274

ISTA (1990). Amendments to the International Rules for Seed Testing, 1985. ISTA, Switzerland.

Lahiri, A.N. and Kharabanda, B.C. (1963). Germination studies on arid zone plants. II Germination inhibitors in the spikelet glumes of *Lasiurus sindicus*, *Cenchrus ciliaris* and *Cenchrus setigerus*. *Ann. Arid Zone*, **1**(2): 114-126.

Leadem, C.L. (1987). The role of growth regulators in the germination of forest tree seeds. *Pl. Growth Reg.*, **6**: 61-93.

Martins, C.C., Velini, E.D. and Martins, D. (1997). Dormancy breaking in southern sand bur seeds. *Planta Dainha*, **15** (1): 61-71.

Snedecor, G.W. and Cochran, W.G. (1967). *Statistical Methods*. AMEC IOWA State University Press.

Paleg, L.G. (1960). Physiological effects of Gibberellic Acid. 1. On carbohydrate metabolism and amylase activity of barley endosperm. *Pl. Physiol.*, **35**: 293-299.

Pandeya, S.C. and Pathak, S.J. (1978). Germination behaviour of some ecotypes of anjan grass under dry storage and physical stress. Proc. 1st Int. Rangeland Congress, USA. pp.376-383.

Previero, C.A., Martins, L., Fonseca, R.H.A. and Groth, D. (1996). Effect of storage of guinea grass (*Panicum maximum* Jacq.) on treatment to break dormancy. *Revista Brasileira de semetes*, **18**(1): 143-148.

Whalley, R.D.B. (1965). Physiology of seedling vigour in grasses. In: *Biology and utilization of grasses* (Ed. C.M. Muckell). Academic press.

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