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THEME:
HORTICULTURE FOR FOOD SECURITY AND ENVIRONMENTAL SUSTAINABILITY IN A CHANGING CLIMATE

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CROP PROTECTION

EFFECT OF STORAGE MOISTURE CONTENT AND TEMPERATURE ON GERMINATION BEHAVIOUR OF JUTE MALLOW (*Corchorus olitorius*) SEEDS

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ABSTRACT

Effect of storage moisture content and temperature on the germination and viability maintenance of seeds of jute mallow (*Corchorus olitorius*) was investigated at the Federal University of Technology, Minna. Seed moisture content was adjusted to 5.2, 8.3 and 10.3% . The packaged seeds were in rubber-stoppered glass bottles and stored at 10 and 30 °C for 24 weeks. Germination was tested at two weeks interval for 20 weeks and finally at 24 weeks. Seeds were steeped in boiling water for 5 seconds on each testing day to break dormancy before germination was tested. Unsteeped seeds served as the control. Germination of unsteeped seeds was low all through the storage period irrespective of storage moisture content and temperature. Steeping of seeds in boiling water for five seconds significantly increased seed germination at all storage duration an indication that seed dormancy was not lost with age and irrespective of storage environment. Seeds stored better at low moisture content and temperature than at higher ones. Packaging of *Corchorus olitorius* seeds in moisture-proof containers at moisture below 10%, stored at about 10 °C is recommended. Prior to sowing, hot-water steeping of seeds from such lots may be necessary for rapid and uniform germination irrespective of storage duration.

Keywords: Storage moisture, temperature; germination, seed, jute mallow

INTRODUCTION

Corchorus olitorius (jute mallow) is an Afro-Arabian variety and members of the family *Tiliaceae*. It is quite popular for its leaves that are used as vegetable. Jute leaves are consumed as a popular vegetable in various parts of the world including West Africa. It is called "ewedu", "abuhara" and "malafiya" in Yoruba, Igbo and Hausa respectively in Nigeria. It is made into a common soup or sauce in some West Africa cooking tradition. Jute is also a popular dish in the Northern provinces of the Philippines where it is known as "salvyot" (Moses *et al.*, 2004). The leaves are rich in beta carotene, iron, calcium and vitamin C. The plant is particularly good for sick people who have difficulties in swallowing as it is slippery in texture (Moses *et al.*, 2004). Seeds of *Corchorus olitorius* are also known to exhibit dormancy and steeping in hot water at 97 °C for five seconds to ensure high germination has been recommended by Oladiran (1986). It has been shown in other crop species that the rate of loss of seed dormancy may vary with seed moisture content and storage temperature. Information appears to be lacking on the relationship between storage period and environment on the rate of dormancy depletion in *C. Olitorius*. The objective of this study was to determine the storage behaviour of dormant *C. olitorius* seeds at different seed moisture content and temperature.

MATERIALS AND METHODS

The experiment was conducted at the Laboratory of Crop Production Department, Federal University of Technology, Minna, Nigeria. Seed moisture content of "Oniyaya" variety of *Corchorus olitorius* was adjusted to 8.3 and 10.3% from an initial moisture content of 5.2%. Prior to storage, the seeds at the three moisture contents were packaged in rubber stoppered glass bottles and were stored at 10 or 30 °C for 24weeks. Germination test was carried out at the onset of storage and at two weeks interval afterwards by placing four replicates of 50 seeds each on distilled water-moistened absorbent paper in plastic Petri dishes; incubation was done at 30 °C for a period of 28 days. The germination counts taken were expressed in percentages. The data collected were subjected to analysis of variance (ANOVA) and means were separated using the least significant difference technique (LSD). All data in percentages were transformed to arcsin values before statistical analysis.

RESULTS

Right from the onset of storage the germination of unsteeped of the different moisture content was poor ranging from about 3 to 12.5% with the highest values recorded for seed at 5.2 and 8.3% (Fig 1). Decrease in germination was recorded as from two weeks of storage irrespective of seed moisture contents and storage temperature. This trend was maintained throughout the study period except in seeds at 5.2% moisture content stored at 30 °C in which about 13% germination was recorded at 20 and 24 weeks after storage (WAS). As from 12 WAS, significantly higher germination was recorded in seeds stored with 5.2% moisture content than at higher moisture contents at both storage temperatures. Seed with 10.3% moisture contents failed to germinate at 24 WAS. Figure 2 shows that germination was greatly promoted by hot-water steeping at all the testing periods with a range of about 71 to 97%. Germination was significantly ($P<5\%$) higher in seeds packaged at 5.2% mc than at 8.3 and 10.3% mc across storage temperatures. Though acceptable higher germination was maintained in all treatments throughout the storage period, it is evident that storage of seeds at moisture content of 10.3% at 30 °C resulted in poorer storability.

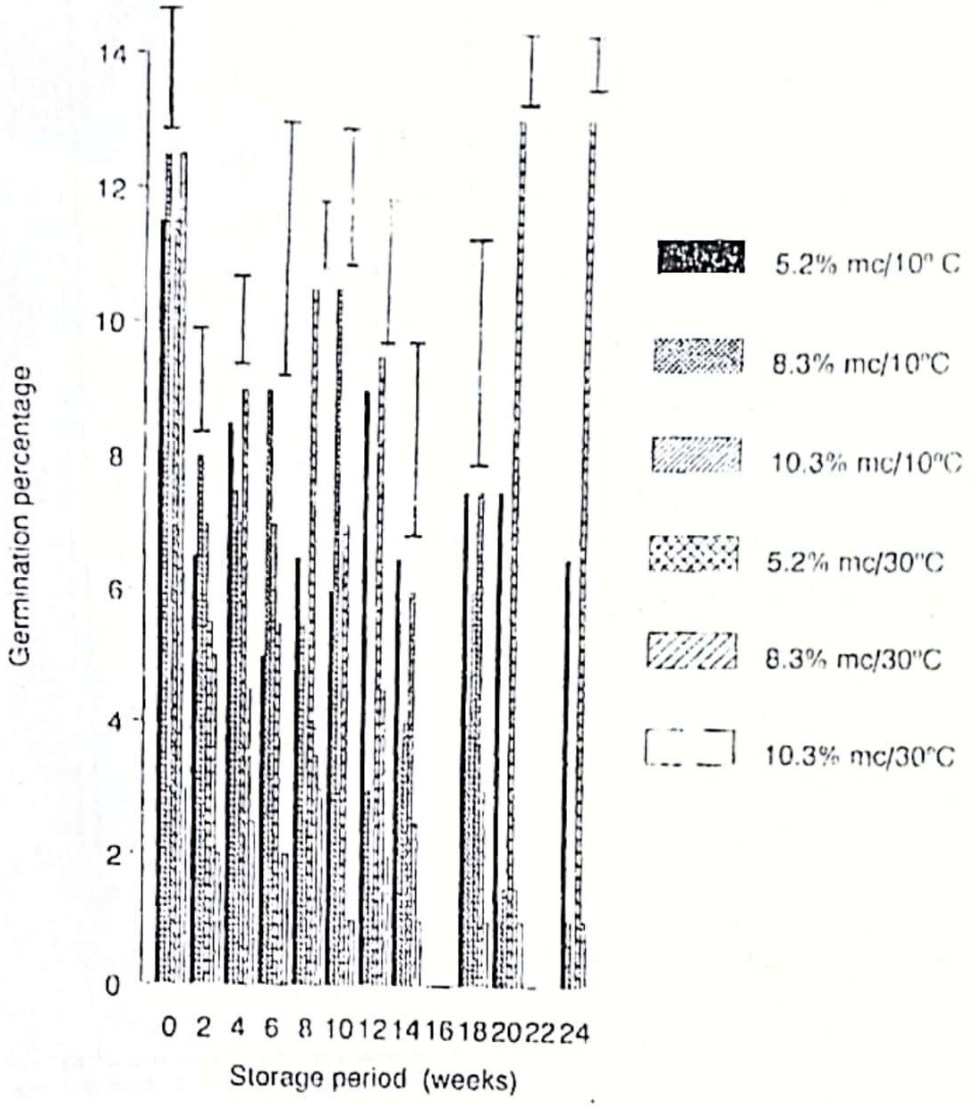

Fig 1 Germination percentage of seeds following storage at different moisture contents and at 10 and 30° C without hot water steeping

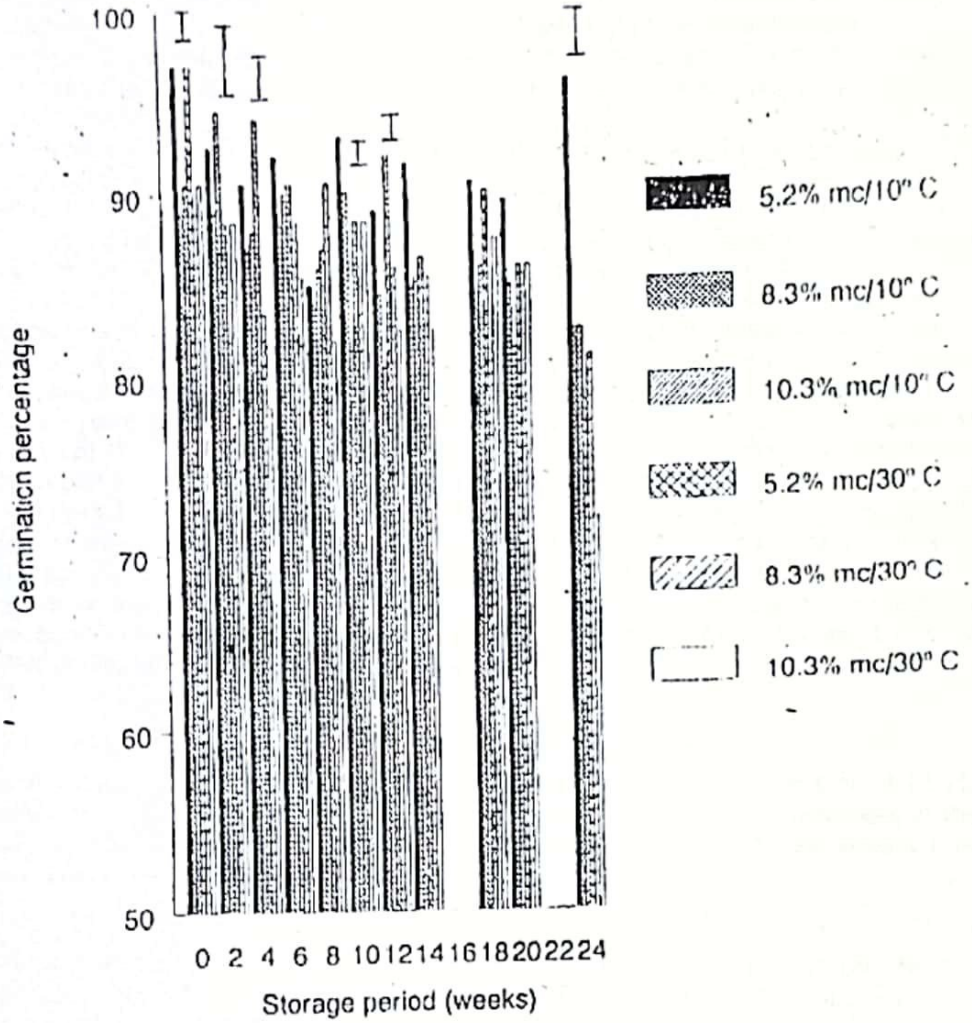

Fig 2 Germination percentage of seeds following storage at different moisture contents and at 10° and 30° C with hot water sleeping

It is note worthy that seeds stored with 10.3% moisture content which failed to germinate at 24 WAS when unsteeped, recorded about 71-78% when steeped in hot water.

DISCUSSION

In this study, hot -water steeping of seed resulted in significant improvement in germination compared to unsteeped seeds. This agrees with the findings of Oladiran (1986) and the report of Schippers (2000). The improvement in germination was said to be due to the softening of the hard seed coat. Dhillon and Singh (1996) are of the view that this treatment might improve seed germination by the creation of some cracks on the seed coat which then permit easy seedling emergence.

Except in few instances in this study, seed packaged at 5.2% mc gave higher germination percentages than those at 10.3% at temperatures of 10 and 30 ^{o}C with or without hot-water steeping. This is expected since jute mallow produces orthodox seeds which are reputed to have long storability because biochemical activities are slowed down at low moisture content (Vartucci *et al.*, 1994). Low storage temperature and moisture content are therefore always recommended to slow down the deterioration processes during storage (Vertucci *et al.*, 1994) and thus reducing the loss of seed viability (Rao *et al.*, 2006). Without hot-water steeping, the germination of seeds stored at the three moisture contents and two temperatures in this study remained at low levels throughout the storage period. This result is contrary to what had been reported in other crop species in which the presence of hard seed coat was said to be responsible for dormancy. In peach, the seed coat is known to provide physical impediment (mechanical resistance) to germination (Mehanna and Martins, 1985) and a significant increase in the germination of the seed was recorded when stratification was done for up to 75 days at 10 ^{o}C (Sharma and Singh, 1978). In *Cucumis sativa*, the requirement for after-ripening of seed at 37 or 47 ^{o}C was report by Weston *et al.* (1992) to significantly reduce the time required to attain 50% germination of the seed lot. In little mallow (*Malva parviflora*), the seeds of which also required scarification, germination was reported to increase with storage time even though, germination did not exceed 47% in 13 months. The absence of improvement in the germination of unsteeped *Corchorus olitorus* seed in this study despite the setting in of loss of viability at the tail end of storage may suggest one or two things. It is either that the storage moisture content and or temperature were not high enough, or the storage duration was too short. More studies involving the use of higher seed moisture contents are recommended for a better understanding of the relationship between storage moisture content and dormancy depletion in this crop.

CONCLUSION

Evidence from this study reveals that seeds of *C. olitorius* stored better at 5.2% mc than at 10.3% mc. Also, seed stored better at the temperature of 10 ^{o}C than at 30 ^{o}C. Furthermore, no significant improvement in the germination of unsteeped seed was recorded under all treatments. Hot water-steeping may always be necessary if seeds are stored within the range of moisture and temperature used in this study.

RECOMMENDATION

Seeds of *C. olitorius* should always be stored at moisture contents below 10% to ensure optimum longevity. Furthermore, the steeping of *C. olitorius* seeds in boiled water (about 97 ^{o}C) for 5 seconds is upheld.

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