GLOBAL SCIENCE AND TECHNOLOGY (ISSN 1984 - 3801)

EFFECT OF WATER CONTENTS AND STORAGE ON CAJU-DE-ÁRVORE-DO-CERRADO SEED GERMINATION

Rafael Espósito de Lima¹, Aurélio Rubio Neto², Fabiano Guimarães Silva¹*, Juliana de Fátima Sales¹, João das Graças Santana¹, Ricardo Monteiro Corrêa³

Abstract: This study evaluated the physiological quality of caju-de-árvore-do-cerrado [Anacardiumothonianum (Rizz.)] seeds stored with different water contents. Seeds containing 29.5% moisture (moisture at harvest) were subjected to drying in an oven (30 °C) until reaching moisture of 20.0% or 16.8%. Groups of seeds of the three moistures were stored in a D.B.O. chamber at 18 ºC for up to 12 months. After each storage period (0, 4, 8 or 12 months) the seeds were placed in a “Mangesldorf” germinator to evaluate the germination velocity index and the percent germination. Seeds at 29.5% moisture, subjected to storage were not viable regardless of the storage period. In contrast, as the seed moisture was reduced to 20.0 or 16.8% viability was maintained after 12 months storage.

Keywords: anacardiumothonianum Rizz.; savannah fruits; desiccation tolerance.

INFLUÊNCIA DO TEOR DE ÁGUA E DO ARMAZENAMENTO NA GERMINAÇÃO DE SEMENTES DE CAJU-DE-ÁRVORE-DO-CERRADO

Resumo: Este trabalho teve como objetivo avaliar a qualidade fisiológica de sementes de caju-de-árvore-do-cerrado [Anacardiumothonianum (Rizz.)] armazenadas com diferentes teores de água. As sementes com umidades de 29,5% (umidade de colheita) foram submetidas à secagem em estufa (30 ºC), até chegar às umidades de 20,0% e 16,8%. Grupos de sementes com as três umidades foram armazenadas em câmara tipo B.O.D. a uma temperatura de 18 ºC por 12 meses. Após cada período de armazenamento (0, 4, 8 e 12 meses), foram colocadas para germinarem em germinador tipo “Mangesldorf” e avaliadas por meio das características de índice de velocidade de germinação e porcentagem de germinação. Sementes com 29,5% de umidade, submetidas ao armazenamento não apresentaram viabilidade independente do período de armazenamento. Por outro lado, com a redução da umidade das sementes para 20,0 e 16,8%, estas mantiveram viabilidade quando armazenadas por até 12 meses.

Palavras-chave: anacardiumothonianum Rizz.; frutos do cerrado; tolerância a dessecação.

¹ Instituto Federal de Educação, Ciência e Tecnologia Goiano – Campus Rio Verde. Rod. Sul Goiana, Km 01, Zona Rural, Caixa Postal 66, Rio Verde (GO). CEP: 75901-970. * E-mail: fabianocfetrv@yahoo.com.br. Autor para correspondência.
² Universidade Federal de Goiás – Campus Jataí. Rodovia BR 364, km 192, Setor Parque Industrial, Caixa-Postal: 3, Jataí (GO). CEP: 75801-615.
³ Instituto Federal Minas Gerais – Campus Bambuí. Fazenda Varginha, Estrada Bambuí-Medeiros, Km 5, Bambuí (MG). CEP: 38900-000.

Recebido em: 29/12/11 Aprovado em: 11/04/12
INTRODUCTION

The Brazilian savannah covers 207 million hectares, over several states, such as Goiás, Minas Gerais, Tocantins, Bahia, Maranhão, Piauí, Mato Grosso, Mato Grosso do Sul, Pará, Ceará, Rondônia and Distrito Federal (VARGAS; HUNGRIA, 1997), and is the second largest biome (SANO; ALMEIDA, 1998). Similarly to the Amazon forest, the savannah contains an enormous biological richness in animal and vegetable species (SHIKI et al., 1997); however, no orchards of native species are found, the sustainable management to conserve its biodiversity is lacking (VALE; FELFILI, 2005). The native savannah had from 40 to 70% of its area suppressed for agriculture and ranching, urban use, mineral extraction, among other activities (BALDUÍNO et al., 2005). Most native species reproduce by seeds, and their viability is short; therefore, they should be sown as early after harvest as possible (SILVA et al., 2001).

Anacardium othonianum Rizz. is a 3 to 4 m tall plant, and its canopy is 3 to 4 meters wide. Its pseudofruits are 2 to 4 cm long and 2 to 3 cm diameter, weighing from 5 to 12 g. The rind color of the ripe pseudofruit is yellow or red, and is well known and appreciated in that region. Its common name is caju-de-árvore-do-cerrado, cajuzinho or just cajuí. This species is a fruiting tree typical of the savannah, with a preference for the more dense formations (VIEIRA et al., 2006).

The plant has manifold uses: food, from in natura pulp or as juice, liquor and preserves. Also, the nut consists in an alternative food source after roasting (SILVA et al., 2001). An expectorant resin is extracted from the leaves (PINTO, 1993).

The present knowledge about storage techniques for the seeds is limited to plants of agricultural interest. Little is known about the seed requirements of most wild species (HEYWOOD, 1989).

Seed initial quality, meaning those intrinsic at harvest, should be maintained, as much as possible, until sowing (CARNEIRO; AGUIAR, 1993). Maintaining seed physiologic quality is fundamental for germplasm banks and for the process of replanting degraded areas, for this would allow the use of plant species and different times and away from its origin.

Frequently, several techniques are studied looking for better storage conditions, and the major conservation technique for seed conservation during storage still is the reduction of its metabolism, being it by water removal or by reducing temperature. However, several tropical species, mostly native Brazilian trees, are not tolerant to drying at the desirable levels for conservation during storage, which demands the development of specific technologies for their conservation (KOHOMA et al., 2006).

Storage starts in the field due to environmental variables, and can vary as a function of plant species, initial seed quality and conditions to which they are subjected. After reaching its maximum physiologic quality, the seed has to be protected from adverse factors to maintain that quality. From the moment the seed is harvested, dried and processed, eliminating unfavorable factors that reduce the seed’s physiological quality, quality maintenance becomes dependent of storage conditions (POPINIGIS, 1985; MARCOS FILHO, 2005).

Research to develop storage technologies for the genus Anacardium is scarce, including the species A. occidentale, which is commercially important. This fact is worsened for other cashew species native from the savannas, which are still in the domestication process, such as the species of this study. Considering the present difficulty in preserving caju-de-árvore-do-cerrado seed viability during storage, this study evaluated the effect of seed water contents and drying on improving storage ability, to guarantee a seed source for commercial seedling production.

MATERIAL AND METHODS
Seeds (ripe fruits), still on Caju-de-árvore-do-cerrado \([\text{Anacardium othonianum} (\text{Rizz.})]\) plants, were collected on October 2006, at Fazenda Gameleira, county of Montes Claros de Goiás - GO (16° 07’ S – 51° 18’ W, 592 m above sea level).

After removing the pseudofruits, seeds were immersed in Vitavax-Thiram\(^\circledast\) [active ingredient (carboxina + tiram): 200 + 200 g/L], at 300 mL commercial product per 100 kg seeds and 500 mL distilled water per 100 kg seeds.

Seed initial water contents was determined by drying in an oven at 105 ± 3°C for 24 h, according to the Rules for Seed Analyses (BRASIL, 2009). Based on previous research, the seeds were placed in a drying oven at 30 °C ± 3, with forced air circulation until reaching the desired moisture contents. After reaching the appropriate moisture (20 and 16.8%), the seeds were placed in plastic bags, which were enclosed by high density polyethylene bags to minimize gas exchange with the environment. Storage was done in B.O.D. (Byological Oxygen Demand) chamber adjusted to 18 °C.

The germination test was done in a Mangesldorf germinator, adjusted to 30 °C. The test was done in germitest paper roll, moistened with distilled water at 2.5 times the weight of the dry substrate. Daily counts were done until complete stabilization to compute IGV (Index of Germination Velocity) and Germination Percentage. The evaluations were done considering radicle protrusion to compute IVG, according to Maguire (1962).

The experimental design was completely randomized in a 3 x 4 factorial, with three seed moisture contents [29.5 (moisture at harvest), 20 and 16.8%], with 4 storage times (0, 4, 8 and 12 months), with three repetitions of 40 seeds. The data were transformed by \(\sqrt{X + 0.5}\) and, subsequently submitted to the analysis of variance by the F test at 5% probability, and the treatments compared by polynomial regressions.

**RESULTS AND DISCUSSION**

The moisture content of \(\text{A. othonianum} (\text{Rizz.})\) seeds at harvest was 29.50%, near to that reported for \(\text{A. occidentale}\), which was 25% (PATTINSON, 1968). In general, cashew seeds moisture, when they fall from the tree, is around 20 to 22%. The time required for the seed to reach the water contents of 20 and 16.8% was 120 and 240 hours, respectively, at 30°C (MWASHA et al., 1997).

Reducing seed moisture from 29.5% (moisture at harvest) to 20.0 or 16.8% did not affect vigor or germination percentage at any storage time (Figure 1 and 2). In contrast, seeds stored with 29.5% moisture were not viable at any of the times evaluated. Naves et al.(1992) reported for this same species, that emergence was affected after storage in card board boxes, at room temperature, for 30 and 60 days, with emergence of 38.67 and 34.67%, respectively.

Probably such viability reduction in such a short time occurred because seeds were stored without previous reduction of water content and of the storage temperature (environment). In general, reducing temperature and moisture of seeds and environment reduces seed metabolism, and associated deterioration microorganisms are inhibited, increasing seed longevity (VIEIRA et al., 2001).
Effect of water…

Figure 1 - Index of germination velocity as a function of storage time at each seed moisture content.

After 4, 8 and 12 months storage, seeds that had moisture contents reduced to 20 or 16.8% had greater indices of germination velocity (Figure 1) and greater percentage of germinated seeds (Figure 2).

These results indicate an orthodox characteristic of this species, as shown previously for *A. occidentale*, for which seeds stored at 6% moisture were viable for 70 days while those stored near 20% moisture remained viable for approximately 5 days (MWASHA et al., 1997).

Figure 2 - Germination percentage as a function of storage time at each seed moisture content.

**CONCLUSION**

Reducing *Anacardiumothonianum* Rizz. seed moisture content to 20 or 16.8% maintained seed viability after storage at 18 °C for up to 12 months.

**ACKNOWLEDGMENTS**
The second author acknowledges CNPq for the scholarship; Mr. Arlindo Thomáz da Silva and family for giving the plant material used in this study.

REFERENCES


