EFFECT OF DIFFERENT STORAGE CONDITIONS ON *Achyrocline satureioides* (ASTERACEAE) SEEDS

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Abstract

Achyrocline satureioides (Lam.) D.C. (marcela, macela) is a South American medicinal shrub widely used in folk medicine. Extracts of its inflorescences exhibited anti-inflammatory, analgesic, antispasmodic, constipating and sedative activities in pharmacological investigations. The aim of this work was to observe the influence of storage conditions on seed quality. Achenes of *A. satureioides* were stored for six months under five conditions: paper bags on ambiental conditions at 19 to 23°C (T1); paper bags on desiccator with silica gel at 19 to 23°C (T2) and at 5 to 6°C (T3); vapor proof alu-laminated PE bags (T4); sealed small amber bottles (T5). Germination tests and moisture content determinations were carried out every thirty days. Seeds were harvested in March 1994 at Eldorado do Sul (State of Rio Grande do Sul, Brazil). In the beginning of storage period, seeds showed 68% of germination capacity and 10,8% of moisture content. Germination tests were applied using 50 achenes replicated five times at 20°C and constant light (27,708 $\mu E/m^2/s$ or 1036,25 lux). The moisture contents were determined using four replications of 0,05g by the constant temperature (105°C ± 3°C) oven method. Use of hermetical conditions (T4 and T5) allowed an increase in moisture content (2 to 3,5%) and decline in germination capacity. Therefore, moisture content of 10,8% is too high for hermetically sealed storage methods. The use of paper bag storage at ambiental conditions decreased seed viability and changes in moisture content were observed. These facts were expected due to the great influence of ambiental temperature and relative humidity. The best results were achieved with methods using. T2 maintained moisture at the initial level during six months. T2 and T3 promoted an increase in germination during the storage period (68% to 71%) suggesting a post-harvest effect.

1. Introduction

Pharmacological studies proved that *Achyrocline satureioides* has anti-inflammatory, analgesic, antispasmodic, constipating and sedative activities (Simões *et al.* 1988). As a consequence, its use is increasing both in folk medicine and in pharmaceutical preparations.

Achyrocline is a genus of 25-30 species primarily from South America, tropical Africa and Madagascar (Nesom, 1990). The distribution area extends of 30°N to 41°S (Giangualani 1976). *A. satureioides* occurs in the whole Brazilian territory, less in amazonic region (Correa Jr. *et al.* 1991). This species is described as an erect herb, with cylindrical stems, lanceolate sessile leaves, densely tomentose. Corimbous inflorescence with hermaphroditic yellow flowers. Achenes less than 1,0 mm long, glabrous with papus of numerous bristles (Giangualani 1976).

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Although there are many important medicinal species of plants in Brazil, information about agronomical characteristics is scarce. *Achyrocline satureioides* is an example of this: it is widely used, but the raw material is collected from wild growing stands. A possible reduction in "marcela's" natural occurrence areas is also a matter concern. The way to overcome these problems is by introducing cultivations. Cultivation of medicinal plants allows production of good quality raw material and it is the main tool for preserving and maintaining their germoplasm (Palevitch 1991).

The determination of cultural practices for *A. satureioides* depends on the amplification of studies about plant propagation and conservation of wild material. Storage of seeds is necessary to conserve gene resources for breeders and gene banks (Kretschmer 1989). In this context the present work was focussed on studying the aspects of storaging seeds for a period six months.

2. Material and methods

The experiments were carried out in the Departamento de Horticultura e Silvicultura (Universidade Federal do Rio Grande do Sul/Porto Alegre/Brazil). Achenes for trials were harvested in March 1994 at Eldorado do Sul, State of Rio Grande do Sul, Brazil (30°05'27" S; 51°40'18" W; altitude 46m). After harvest the material was cleaned to take off papus and impurities.

Seed lote used in trials showed 68% of germination capacity and 10,8% of moisture content in the beginning of storage period. Each treatment applied six seeds samples of 0,25g, containing approximately 8.400 achenes.

During six months seeds were stored under five different conditions: paper bags on ambiental conditions at 19 to 23°C (T1); paper bags into desiccator with silica gel at 19 to 23°C (T2) and at 5 to 6°C (T3); vapor proof alu-laminated PE bags (T4); sealed small amber bottles (T5). Evaluations were made each 30 days, being determined moisture content and germinability.

2.1. Moisture determination

The moisture contents were determined by the constant temperature oven method (105°C ± 3°C/24 hours), using four replications of 0,05g in a complete randomized design.

2.2. Germination test

Were used to perform germination tests fifty achenes replicated five times in a complete randomized design. Achenes were placed on moist analytical filter paper in 9 x 2cm petri dishes.

Germination occurred in an incubator (B.O.D) with fluorescent lamps, supplying 27,708 $\mu E/m^2/s$ or 1036.25 lux during 24 hours. Temperature was adjusted to 20°C. Counting was carried out at 7^{th}, 14^{th} and 21^{th} day after sowing.

3. Results

3.1. Moisture content

The analysis of variance (F Test) showed that the storage method has more influence on moisture content than time. However the interaction between time and storage method was not significant.

The moisture content at the beginning of storaging was 10.8%, T2 (paper bags into desiccator) maintained the moisture more stable, and achenes in the others treatments had the moisture content increased (Table 1).

Figure 1 shows that the moisture content attended the seasonal variation of relative humidity, since the first and second months of storage corresponded to the winter season, in which there is more vapor on the air. These results indicate that the seed moisture was always kept higher than that recorded in the beginning of the experiment.

3.2. Germinability

The analysis of variance showed that the interaction between the storage method and time was significant.

Desiccator with silica gel under ambiental conditions or into refrigerator (T2 and T3) increased seed germinability during the experimental period while the others treatments reduced the germination percentage, which was 68% in the beginning (Table 2). The highest germination was observed in the treatments that maintained the moisture more constant. Meanwhile, when the achenes acquired more moisture (T4 and T5) the germination percentage decreased along the time, making evident that higher moisture accelerates the seed aging.

4. Discussion

Results showed that the best storage conditions were obtained with T2 (19 to 23°C/45% RH), because the moisture content was kept at the same level until the end of the experimental period, increasing germination. These conditions were similar to those described by Harrington (1972) as ideal to store most seeds for several years.

The increase on seed moisture content on T3 may indicate that the humidity inside the desiccator was too high for cold storage. Bewley and Black (1986) found that temperatures between 0 and 5°C are desired, but under high relative humidity moisture acquisition by seeds may occur. However the use of desiccator on refrigerator can be a good storage method to summer months when the ambiental temperature is higher, but it is necessary to test other forms of decreasing humidity into desiccator.

The amber bottles (T5) provided a hermetical environment for the seeds, but the considerable volume of air inside the container, with capacity of 40 ml, allowed seed respiration and humidity acquisition by achenes. Airtight packing (T4) also increased moisture acquisition. Data demonstrated that the initial moisture content of seeds (10.8%) is too high to store *A. satureioides* seeds in air-tight packing. The best moisture content for most seeds is between 5 and 7 % under hermetical storage. Thus, the results suggest that it is necessary to dry *A. satureioides* seeds before hermetical storage.

Each species has an optimal moisture content for storage, possibly associated to the chemical composition of seeds (Villiers, 1978). In the present case, it is still necessary to determine the best moisture content to conserve the seed quality in *A. satureioides*.

Seed moisture variation depends on atmosphere humidity when storage in paper bags, but this method is preferred when seed drying is not possible.

The Tukey test indicated some intermediary results in moisture content (Table 1), only T2 and T5 had a response more defined. However, Harrington (1972) found that a variation of 1% on seed moisture can reduce half full the seed life. Under this point of view we can consider significant the differences observed between other treatments.

The increase in seed germination along the time in T2 (Table 2) suggests the occurrence of a post-harvest effect. This observation is true in T3 also. Kretschmer (1989) also verified this effect in seeds of *Artemisia dracunculus* (Asteraceae) after one year of

storage. This kind of event is related to plant adaptive characteristics, as demonstrated by Athey and Pippen (1989) who found that seeds of *Cacalia atriplicifolia* (Asteraceae) sprout only one year after the dispersion. Thus, the post-harvest effect must be studied better in *A. satureioides.*

In general the reduction in seed germinability in these tests was small, when compared with results obtained by Ikuta (1993), who showed a reduction of 35% in seed germination of *A. satureioides* after ten months of storage.

5. Acknowledgements

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Table 1 - Moisture content of achenes of *A. satureioides* under different storage conditions during six months

Storage conditions	Moisture content
	%.
T1- paper bags on ambiental conditions	12.1 abc
T2- paper bags into desiccator (19 to 23°C)	10.8 c
T3- paper bags into desiccator (5 to 6°C)	11.9 bc
T4- vapor proof alu-laminated PE bags	12.5 ab
T5- sealed small amber bottles	13.3 a

Means followed by distinct letters are significantly different ($P \leq 0.05$). Tukey test.

Table 2 - Influence of different storage conditions on seed germination in *A. satureioides* - T1-paper bags on ambiental conditions at 19 to 23°C; T2-paper bags into desiccator with silica gel at 19 to 23°C and T3-paper bags into desiccator with silica gel at 5 to 6°C; T4-vapor proof alu-laminated PE bags; T5-sealed small amber bottles (values transformated by arcsin$\sqrt{\%/100}$)

	Storage months					
	1	2	3	4	5	6
T1	77 b ABC	89 a A	82 ab AB	72 bc BC	67 b C	73 b BC
T2	85 ab BC	88 a ABC	81 ab C	92 a ABC	94 a AB	95 a A
T3	92 a A	95 a A	74 b B	90 a A	89 a A	94 a A
T4	88 ab A	92 a A	88 a A	58 c B	71 b B	69 b B
T5	91 a A	88 a AB	72 b C	77 b BC	63 b C	74 b C

Means followed by distinct letters are significantly different, lower case on columns and capital letters on rows. ($P \leq 0.05$). Tukey test.

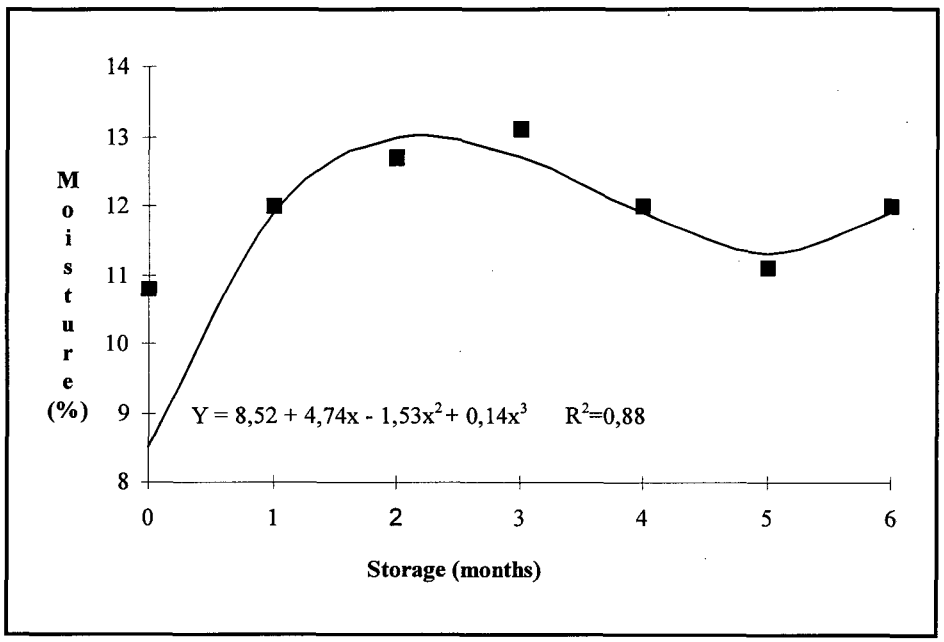

Figure 1 - Variation on moisture content of achenes of *A. satureioides* during six months