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QUANTITY OF POTASSIUM NITRATE SOLUTION AND THE GERMINATION OF BRACHIARIA SEEDS

F.F. Toledo[1]
C.S. Carvalho[2]

INTRODUCTION

The regulations for seed analysis do not specify the exact quantity of potassium nitrate solution to be used in the germination tests for seeds of the *Brachiaria* genus. As a consequence, laboratories for seed analysis have different criteria to determine the amount of the solution to use.

A review of the literature clearly indicated the existence of several criteria to determine the amount of water and solution in the germination tests. STILES (1949) concluded that seeds of different species require distinct amount of water for germination. Bailey & Heit, cited by DELOUCHE (1960), based on research results with several species, reported that the different water volumes added to the substract were responsible for the variability in the germination tests. Delouche emphasized the importance of Heit's conclusions on the high sensitivity of seeds to the moisture contents of the substract and made observations on the best results of germination on paper towel obtained at moisture levels considerably inferior to those currently used by the laboratories.

COLLIS-GEORGE & SANDS (1961) reported the results of several experiments indicating that variability of the germination tests with barley, alfalfa and ryegrass seeds were due to the different moisture levels used.

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[1] [2] Escola Superior de Agricultura "Luiz de Queiroz", USP, Piracicaba.
[2] Maschietto Seeds CB., Penópolis, SP.

In a study to determine the most favorable moisture level for inhibition and germination of rice, beans and corn seeds, VICENTE *et alii* (1961) observed that seeds of beans and corn completed inhibition quicker under higher moisture levels than those most adequated for good germination. For rice seeds, however, lower moisture levels were most adequate for inhibition and germination.

According to PETERSON & COOPER (1979), KARE & WILBIRT (1965) observed a high variability in moisture levels in substrats used in 18 seed analysis laboratories. In their report they suggested that research should be carried out to determine adequate moisture levels for each species. Alternatively, they suggested the use of the technique of saturation and drainage previous to sowing with the main objective of standardizing the moisture levels.

According to ENGELHARDT *et alii* (1966), seeds of corn presented high germination within a wide range of moisture contents of the substract. Similar results were reported by BELCHER (1974) for several species of the *Abeto* genus.

NORONHA (1967), testing the effects of substracts of towel and filter paper in the germination of rice seeds observed that different water quantities were required for equivalent seed germination. BELCHER (1975) also observed that different water quantities were required for distinct substracts in order to obtain regularity in seed germination.

To evaluate the effect of levels of moisture contents in towel paper on the germination of sorghum and corn seeds, PHANEENDRANATH (1980) used water quantities equivalent to 2, 2.5 and 3 times the respective paper weight and observed that germination decreased as the water contents increased.

USBERTI (1981) reported that farmers claimed that *Panicum maximum* seeds germinated better in field conditions than in laboratory tests. TOLEDO & PEDREIRA (1984) concluded that *P. maximum* seeds germinated poorly when an excess of potassium nitrate was added to the substract. They also concluded that tests conducted with two

sheets of blotters were considerably more reliable than those using a single sheet.

TANAKA *et alii* (1987), working with peanuts, related that seeds with high germination levels were sensitive to variation in the moisture contents of the substract, with both high and low water contents levels being damaging to the germination potential. On the other hand, EIRA *et alii* (1987) reported that high quality cucumber seeds did not show any sensitivity to the different moisture levels tested.

The present work with *Brachiaria* sp. an important forage crop in Brazil today, was carried out at the seed analysis laboratory of Maschietto Seeds Ltda., Penápolis, State of São Paulo, Brazil, to determine the variation usually found in the tests performed under the Seed Analysis Rules.

MATERIAL AND METHODS

Materials

Samples from four lots of seeds of the species *Brachiaria decumbens* Stapf. Prain Fl., *B. brizantha* (Hachst ex A. Rich) Stapf. and *B. ruziziensis* Germain and Evrard Stapf. were collected in the northwest of the State of São Paulo for the analysis of this work. The tests were carried out in a germinator FANEN model 347 with manual control for temperature and light. Blotter paper Germitest was used as substrate. Sheets of approximately 11 cm x 11 cm were weighed and their weight adjusted to 3 grams each by cutting. These sheets were placed in the gerbox and wetted with a 0.2% potassium nitrate solution. The solution was prepared from pure salt (for chemical analysis) and distiled water. Seed scarification was done using commercial concentrated sulphuric acid.

Methods

The following variations of routine procedure described for the analysis of *Brachiaria* seeds in the regulations were introduced as treatments:

Experiment A: Seed germination tests were carried out in the gerboxes with two sheets of blotter paper as substrata. Three levels of potassium nitrate (12, 16 and 20 ml) were added to the substrata. These three treatments were applied to the four seed lots of the three species on four sowing dates. Countings were done at 7, 14 and 21 days, after sowing. The substracta did not receive further watering since the gerboxes were kept air tight by tape.

Experiment B: Substrata of one, two or three sheets of blotter paper of size 11 cm x 11 cm and weighing 3.0 g each formed the three treatments. According to the number of sheets in the gerbox, 6, 12 and 16 ml of potassium nitrate solution were added, i.e, the substrata were saturated, but without solution excess. After sowing, the gerboxes were kept air tight by tape. Coutings were done at 7, 14 and 21 days after sowing. The substract did not receive further watering.

Statistical methods: the statistical analysis were performed separately by species according to a completely randomized design using date of sowing as replication. The means were compared by the test of Tukey.

RESULTS

Experiment A

Table 1 shows the means of treatments concerning the amounts of potassium nitrate solution and their comparison by the test of Tukey. There were no significant differences between the means for *B. decumbens*; for *B. brizantha* and *B. ruziziensis* the addition of 20 ml of nitrate solution reduced germination, indicating that they are sensitive to an excess of solution in the substrata.

Experiment B

Table 1 also shows the means of treatments concerning the number of sheets of blotter paper used as subs-

trata. The results indicated that the use of more than a single sheet can influence the analysis. There was significant reduction in the germination of *B. brizantha* and *B. ruziziensis* when three sheets were used.

Table 1 - Means (% germination of seeds) for amount of solution and number of sheets of paper in germination tests of *Brachiaria* spp.

Experiment A			
Quantity (ml)	*B. decumbens*	*B. brizantha*	*B. ruziziensis*
12	46.50 a	58.50 a	66.75 a
16	50.00 a	58.50 a	57.75 b
20	46.00 a	53.25 b	56.25 b
Coeficient of variation	7.55%	7.04%	15.07%
Experiment B			
Sheets (number)			
1	49.75 a	59.75 a	68.75 a
2	48.25 a	67.50 a	65.00 ab
3	45.25 a	55.25 b	62.00 b
Coeficient of variation	15.18%	10.97%	7.55%

Means are compared by columns.

DISCUSSION

Several authors have reported that excessive moisture in the substrata causes variation in the countings of the germination tests and TOLEDO & PEDREIRA (1984) confirmed that an excess of potassium solution caused a negative effect on the germination of *P. maximum* seeds.

In this work, *B. decumbens* did not respond to the treatments while *B. brizantha* and *B. ruziziensis* showed a decrease in germination when 20 ml of nitrate solution was added to the substrata. *B. decumbens* showed to be, in field conditions, resistant to adverse conditions and these tests may be refleting that. The two other *Brachiaria* species though affected by the treatments were less sensitive than *P. maximum* to an excess of the solution. On the other hand, *B. brizantha* and *B. ruziziensis* had their germination decreased when three sheets of blotter paper were used as substrata while *P. maximum* was not. There was, however, a clear indication that the germination of seeds in those tests was significantly variable. This indicates, therefore, the need for more specifity in the methods of seed analysis.

CONCLUSION

The addition of 20 ml of potassium nitrate solution to the substrata decreased the germination of *B. brizantha* and *B. ruziziensis* seeds. The use of three sheets of blotter paper as substrata also diminished the germination of the above species. Seeds of *B. decumbens* were not sensitive to the treatments (method variations) included in this paper.

SUMMARY

TOLEDO & PEDREIRA (1984) published a paper on the present subject using *Panicum maximum* seeds. This work relates the use of the same methods on seeds of three distinct species of *Brachiaria*. The main conclusions are: a) the addition of an excessive quantity of nitrate solution was damaging to the germination of *B. brizantha* and *B. ruziziensis*; b) the use of three sheets of germination paper saturated with the nitrate solution was also damaging to the seed germination of the same species; c) seeds of *B. decumbens* were not sensitive to the differences of the methods tested.

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