Viability of Bromegrass Seed as Affected by Dehulling and by Storage in Fertilizer

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Seed of bromegrass (Bromus inermis L.) is comparatively large, long, flat, and chaffy. On a weight basis the caryopsis constitutes about 60% of the seed, and the lemma, palea, and other appendages constitute 40%. Such seed cannot be mixed with legume or even with other grass seeds and sown with any degree of uniformity through regular planting equipment such as the cyclone or wheelbarrow seeders or the seed attachment on the grain drill.

Several methods are available for sowing, but each has certain disadvantages. These include seeding by (a) hand, with an endgate seeder or with special seeding equipment, (b) mixing with a small grain seed such as wheat or oats, and (c) mixing with a lime or fertilizer diluent. Seeding by hand is tedious and not always accurate; mixing with a small grain may result in too deep planting. Mixing with lime or fertilizer requires extra labor but will permit surface placement of the seed and also supply a ready source of plant food for rapid seedling development.

Literature Review

If the grain drill is to be used in planting bromegrass efficiently two approaches are apparent. First the seed could be processed by removing all appendages and leaving a free-flowing caryopsis. Such treatments have been reported for tall oatgrass by Schwindiman and Muller (4). In addition deawning of certain Western grass seeds by the use of a hammer mill has been reported by Schwindiman, Sachman, and Hafeniichter (5) and by Weber (6). These investigations indicate that seed processing treatments are entirely practical and useful, making it possible to seed through the regular grain drill seed attachment. A minimum loss in viability has resulted from these treatments.

Mixing with fertilizer as a practical method of applying bromegrass seed has been suggested in Wisconsin (1), Ohio (9), and New Jersey (2). Other suggestions are hand seeding or diluting with a small grain or the use of special seeding devices. No data on the effect of fertilizers on bromegrass seed stored in them have been reported. Studies in Australia by Whittet (7) on alfalfa seed mixed with superphosphate have shown a reduction in germination from 69 to 36%; 6 days after mixing with the fertilizer. Additional studies by Whittet (8) on white clover (Trifolium repens) and perennial ryegrass (Lolium perenne) stored for 7 days in superphosphate, sulfate of ammonia, and mixtures of these two fertilizers showed no effect on the germination of the white clover seed. A reduction in germination from 69 to 22% was found for the ryegrass seed when stored in superphosphate, presumably in the sulfate of ammonia. The mixtures gave the same germination of the ryegrass seed but this was not caused by the superphosphate. In England Hassard suggested that forage seeds may well be seeded with more amounts of fertilizer, indicating that the fertilizer was used in this way.

Methods and Results

Seed of bromegrass was run through a small hammer type mill with suitable screen at 1,200, 1,400 and 1,600 rpm. Immediately after hammer-milling, hulls, broken kernels, and full caryopses were mixed with 40% superphosphate. Germination tests were carried out. Additional seed lots were stored at room temperatures, and germination tests run at weekly intervals for 6 weeks.

Seed lots were also stored in 18% superphosphate and 10-10-10 mixed fertilizers. Storage was in a fieldhouse under indoor conditions such as exist in New Jersey. For 15 months after the initial mixing, seed was stored at intervals for germination tests.

The hammer mill removed the glume and palea in various degrees depending on the speed at which it was run. Operation below 1,200 rpm caused severe damage to the bromegrass seed, as can be seen in table 1, from results of two complete tests. The lower rate of hammer milling gave the highest percentage of completely dehulled seed with intact seed fragments. The 1,600 rpm gave seven-tenths of the seed being fragmented. Germination was severely decreased, ranging from a check of 71% to 36 at 1,200 rpm, 34 at 1,400 rpm, and 22 at 1,600. Apparently bromegrass seed, because of its narrow Caryopsis and the thin protective layer, cannot withstand strong mechanical treatment.

The hand-treated seed, in which all the glumes and the Caryopsis were removed, showed much more favorable results. This seed was stored at room temperature after removal of appendages. These data are given in table 1 and indicate that the reduction in germination was not only caused by the amount of superphosphate applied but also by the mechanical treatment.