IMBIBITION AND GERMINATION OF YELLOW SERRADELLA SEEDS

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Abstract

Newly ripened hard seeds of seven accessions of yellow serradella and a subterranean clover (species of annual legumes) were subjected to a laboratory softening procedure before testing for germination at 20°C. The proportion of soft seeds ranged from 2.4% to 80.2%. More than 70% of the seeds which germinated did so within 7 days of soaking in four of the yellow serradellas and the subterranean clover. Germination was much slower in the remaining three serradellas, GEH72-2A and cvv. Charano and Santorini, taking up to 45 days owing, apparently, to slower imbibition in these lines. Under some circumstances this delayed imbibition could provide a useful mechanism for avoiding seedling losses from false breaks of season, and may also provide opportunities for strategic weed control in regenerating pastures.

Key words: Serradella, legume, hard seeds, germination, imbibition.

Revell *et al*. (1) reported a spread of germination over 35 days in the GEH72-2A accession of yellow serradella (*Ornithopus compressus*), which appeared to be largely attributable to delayed imbibition. The present study was designed to examine patterns of germination in several other accessions of yellow serradella, together with the Nungarin cultivar of subterranean clover (*Trifolium subterraneum*). The standard technique of subjecting hard seeds of subterranean clover to 16 weeks of diurnally alternating temperatures of 60/15°C in darkness for predicting their rate of softening (loss of seed coat impermeability) was used to provide a source of permeable seeds for the germination studies. This laboratory technique has been found to substantially overestimate field softening of yellow serradella at the soil surface (1), where light appears to inhibit the softening process (2). The temperature regime used in this laboratory treatment is also more extreme than that encountered in the field in terms of the time spent at the daily maximum temperature, but this apparently compensates for the fact that the 60°C maximum temperature is above the optimum for the final stage of seed softening in yellow serradella (2).

Materials and methods

Pods of seven accessions of yellow serradella and Nungarin subterranean clover were grown in 1993 at Yelbeni in Western Australia (31°15'S, 117o45'E). Seed characteristics of each accession are shown in Table 1. Four replicate pod lots of each accession were subjected to an initial germination test in which the pods were soaked in petri dishes at a constant temperature of 20°C until no further germination had occurred for five days. Another four replicate pod lots were subjected to 16 weeks of 60/15°C in darkness in a controlled temperat-ure cabinet involving a diurnal pattern of temperature change of 3 hr at 15°C, a linear increase over 9 hr to 60°C, 3 hr at 60°C and a linear decrease over 9 hr to 15oC. Seeds were then tested for germination as above. Seed softening was calculated from the decline in the numbers of hard seeds from those present in the initial test. The moisture content of seeds and the mean weight per seed was determined on a sample of hard seeds remaining after the initial germination test as described by (1).

Results

Seed moisture content of the hard seeds in the initial samples was less than 5.5% (Table 1). The proportion of seeds softened by the 60/15°C treatment ranged from 2.4% in GEH69-A1 to 80.2% in GEH72-1A (Table 1). Germination of GEH72-2A, and cvv. Charano and Santorini seeds continued for up to 45 days (Fig. 1), being slowest in cv. Santorini in which a lag phase of about 14 days occurred before appreciable germination occurred. Germination of the other accessions of yellow serradella and Nungarin subterranean clover was mostly complete within 10 days.

Discussion

The spread of germination in GEH72-2A, and cvv. Charano and Santorini is consistent with that previously reported for GEH72-2A, which was attributed to delayed imbibition (1). Delayed imbibition has also been reported in burr medic (*Medicago polymorpha*) cv. Serena (3), but over a shorter period. It seems likely that the delayed germination in cvv. Charano and Santorini is also attributable to delayed imbibition, though this remains to be confirmed as the presence of imbibed seeds within pods cannot be readily observed. These results suggest that the standard 14 day germination test could seriously underestimate the proportion of germin-able seeds in some accessions of yellow serradella. Con-sideration should be given to at least doubling this test period. The spread of germination found in some access-ions may be of considerable ecological importance by providing a mechanism for avoiding seed losses from false breaks of season. Furthermore, a lag period follow-ed by rapid germination, as evident in cv. Santorini, could provide an opportunity for the chemical control of weeds prior to the main germination of serradella. On the other hand, a spread of germination over several weeks may be a disadvantage in terms of competition from plants of other species which germinate earlier.

References

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