INCREASING GERMINATION RATE AND GERMINATION PERCENTAGE OF SOME KINDS OF SEEDS BY WASHING,DRYING, AND STORING

D.K. McINTYRE, M. RICHARDSON, S. HUGHES, AND G. LEJSEK

Horticultural Services Unit,
City Parks Administration,
Canberra, Australian Capital Territory

INTRODUCTION

Many plants have seeds which are difficult or slow to germinate. When seeds are slow to germinate, and it has been determined that there is no physical barrier to the uptake of water — such as a hard seed coat — then various methods may be used to hasten germination. These methods include the use of gibberellic acid, ethylene, cold stratification, etc.

From the propagator's point of view it is important to have as many seeds germinate as quickly and uniformly as possible.

The technique of hydrating and dehydrating (wetting and drying) offers a simple method which may be used to speed up germination and increase uniformity of germination.

Sen and Osbourne (5) showed that if the embryos of *Secale cereale* were hydrated for 3 to 6 hours, then dehydrated back to their original weight, their germination was more rapid than for untreated seeds when they were re-imbibed. Berrie and Drennan (1) using oats, and Vincent and Carvers (6) using *Rumex crispus*, obtained the same response. All these researchers concluded that seeds which had been hydrated and dehydrated were physiologically more advanced than untreated seeds.

Lush and Groves (2) found that a pretreatment of hydration and dehydration increased the germination rate of annual ryegrass seed. Lush, *et al* (3) found a similar response with *Clematis microphylla*.

Researchers (4,7) working with other plant species have also reduced or broken dormancy in seeds by washing them in running water for various periods of time.

Using running water instead of soaking has certain advantages for hydrating seeds. It removes any substances leached out of seeds, and greatly reduces the growth of bacteria and fungi on the seeds during hydration. These infections can occur quite quickly in water if hydration is carried out by soaking. It possibly also provides a higher oxygen level to the seed, which may be important during the early germination period.

MATERIALS AND METHODS

Several experiements were carried out using two cultivars of *Poa pratensis* (Kentucky bluegrass) — 'Monopoly' and 'Sydsport'; and four species of Australian native grasses — *Poa* sp., *Bothriochloa ambigua*, *Themeda australis*, and *Stipa bigeniculata*.

Seeds were washed in running water continuously for 24 hours and then sown wet — or dried — and stored at 4°C for periods of time ranging from 3 to 28 days.

Germination tests were carried out in petri dishes (100 seeds/dish) using 300 seeds per treatment. The seeds were germinated in cabinets which were illuminated for 8 hours in every 24 with light/dark temperatures of 30°C/20°C, respectively. Germination counts were made daily.

RESULTS AND DISCUSSION

For *P. pratensis* there was a 20% increase in germination after 10 days over the control with washed seed and a 40% increase when the seed was dried and stored for at least 3 days (Figure 1). There was very little further increase in germination when the seed was stored for up to 28 days, but there was no decrease.

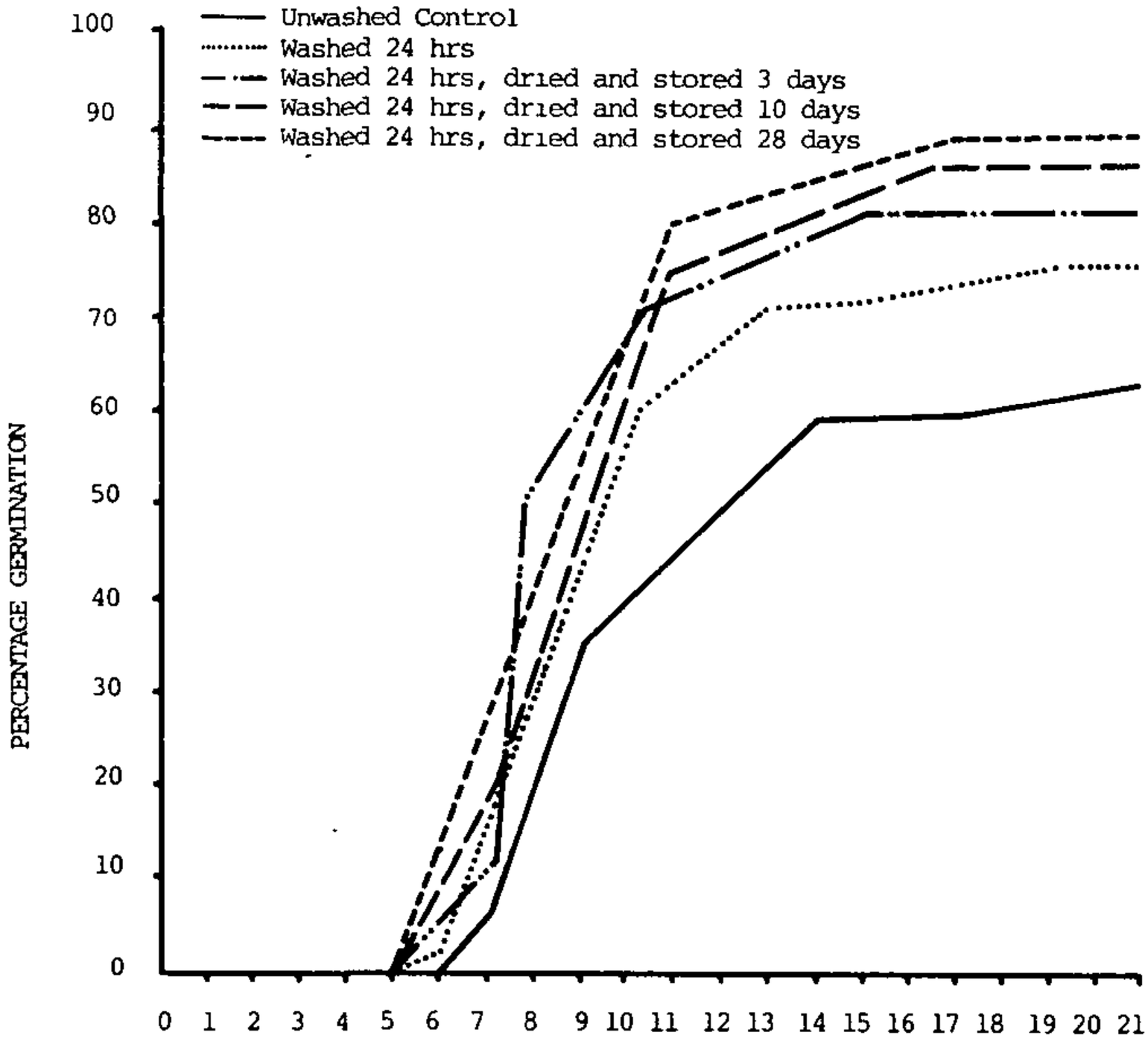

Figure 1. Percentage germination of *Poa pratensis* cv. Monopoly seed washed in running water for 24 hours and then stored for 0, 3, 10 and 28 days, compared with untreated controls.

Figure 2 shows that there was some germination increase after 24 and 48 hours washing in running water, but there was a substantial increase after washing, drying, and storing the seed for 7 days. After 10 days there was an increase from 35 to 95% germination of the washed, dried, and stored seed over the control.

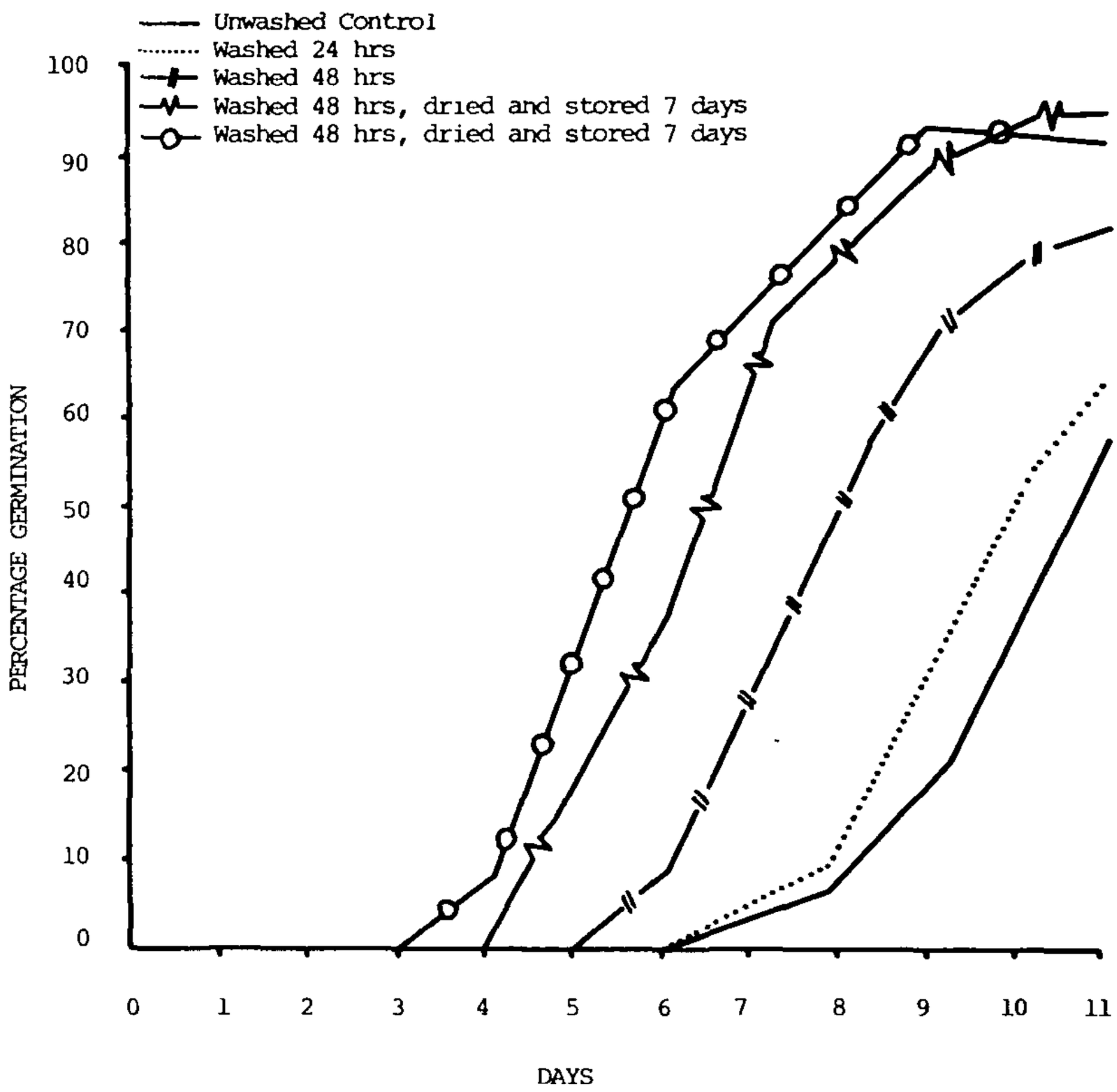

Figure 2. The effect of washing *P. pratensis* cv. Sydsport seed in running water for 24 and 48 hours. Seeds were either sown immediately after washing or sown after drying and storage for 7 days.

From Figure 3 it can be seen that for *Bothriochloa ambigua* there was no difference between germination of seed washed for 24 or for 48 hours, and the untreated control, after 10 days.

There was, however, an increase over the control of 20 to 25% in germination after 10 days for seeds which had been washed, dried, and stored for 7 and for 14 days. There was no appreciable difference between seed stored for 7 to 14 days.

There was no significant increase in germination in *Themeda australis*, *Poa* sp., and *Stipa bigeniculata* seeds that were washed, or washed and stored.

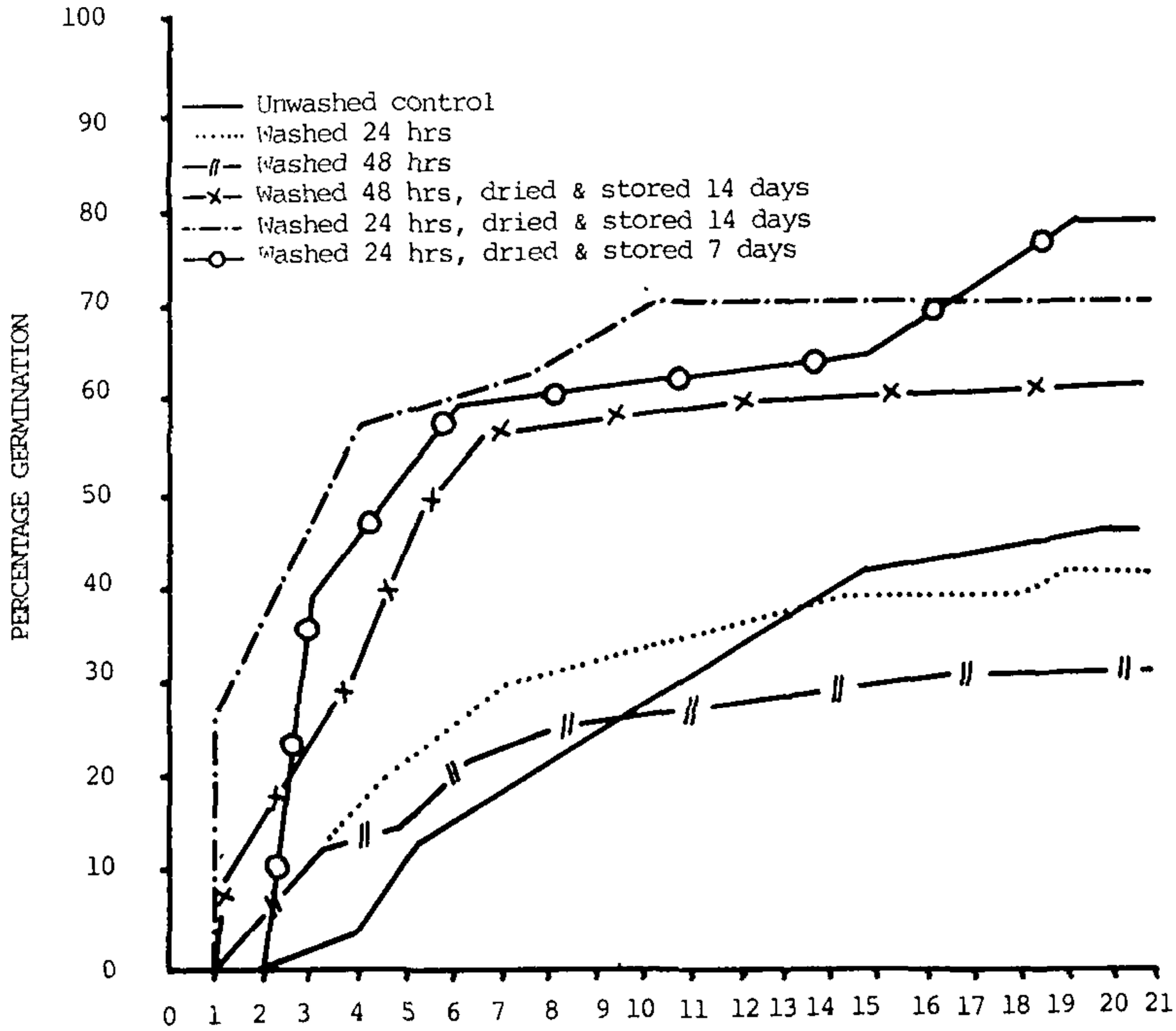

Figure 3. The effect of washing *Bothriochloa ambigua* seeds in running water for 24 and 48 hours. Seeds were sown after washing, and after drying and storing for 7 and 14 days.

The increase in germination rate following hydration and dehydration has a likely explanation in the work of Sen and Osbourne (5). They found that in rye embryos RNA synthesis can be detected within 10 minutes of imbibition, and protein synthesis within 15 minutes. If either newly-synthesised messenger RNA or long-lived existing stored RNA that code for enzymes essential for continued growth, are translated during early protein synthesis, then an embryo that has been previously hydrated and then dehydrated could enter directly into the DNA replicating phase when it is subsequently reimbibed. This would give such seed an advantage over those seeds that had not been treated.

When the pretreatment of hydrating, and dehydrating and storing, produces an increased germination rate it often also produces an increase in the total germination percentage with-

in a normal germination time frame. These increases in rate and in percentage seed germination are of great value to the plant propagator.

It may be of real value to use this method to try and speed up the germination process or to increase the percentage of any seed which are slow to germinate, or have a low percentage germination. In addition, the method is simple and cheap.

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A BRIEF REVIEW OF ETHYLENE IN PROPAGATION

DAVID H. SIMONS

Department of Horticulture
Queensland Agricultural College
Lawes, Queensland 4343

Abstract. Ethylene is a gaseous plant hormone affecting a wide range of plant growth and development responses It is effective in minute concentrations and is extremely common in the environment It is difficult to avoid exposure of plants to ethylene

There is conflicting evidence of the effects of ethylene in plant propagation and minor changes in conditions appear to alter the response from promoting rooting to inhibiting it In some cases ethylene clearly promotes root initiation, or root elongation Ethylene effects in propagation can be tested by adding it, most conveniently as ethephon, or by removing it with ventilation Its action can be inhibited by silver thiosulphate.