

Vigour Test In Oil Seed Rape And Peas

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INTRODUCTION

A vigour testing experiment with spring oil seed rape (*Brassica napus*) and pea (*Pisum sativum*) was performed. The aim of the study was to subject seeds of the two species to "controlled deterioration" and then compare the results of a vigour test with field observations.

There is interest in examining if there is a correlation between the results of a vigour test and the field performance of the seeds to better predict seed quality. In order to test this, a vigour test was applied to a number of seed lots, and the test results were compared to results of field trials, i.e. trials where the development of plants of the different seed lots was followed during the growing season.

If the vigour test is to be considered as applicable there must be a close correlation between its results and results of the field trial, i.e. seed lots with the best test results should have the best field performance. Thus, on the basis of the vigour test it should

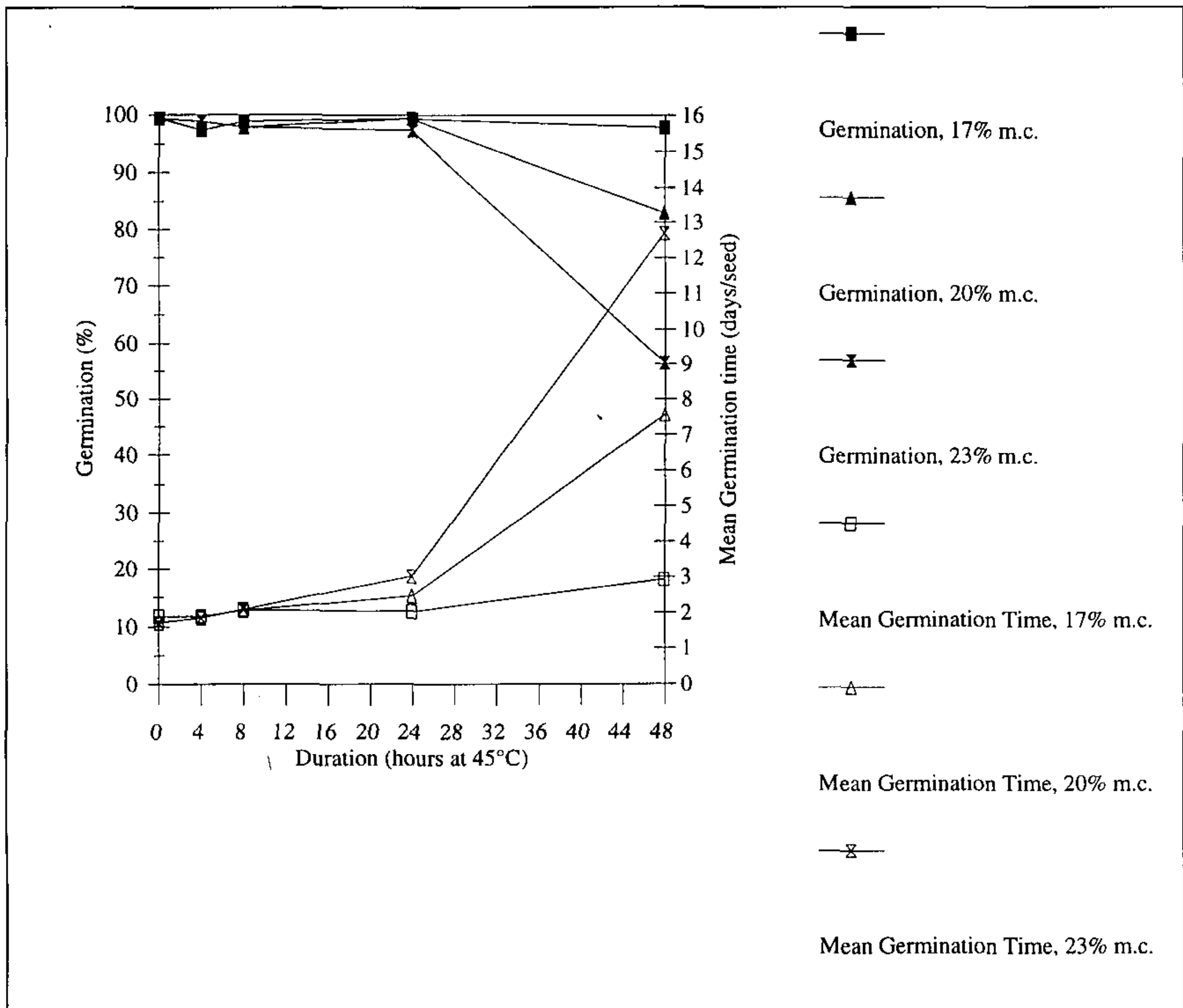


Figure 1. Relationship between germination, moisture content, and storage at 45C in oil seed rape. Germination percentage and mean germination time vs. duration of controlled deterioration.

be possible to rank the seed lots according to the expected field performance. This project is, therefore, based on laboratory and field experiments.

MATERIALS AND METHODS

In the laboratory a preliminary experiment was carried out in order to select an appropriate stress treatment for the two seed species.

As temperature and seed moisture content during seed storage are very important factors controlling the speed of seed aging, these two factors and the duration of the treatments were factors used to accelerate aging of the seed lots. An appropriate level of stress would be where germination capacity is reduced considerably — without killing all seeds — in seed lots of low vigour, while germination capacity of seed lots of higher vigour would be less affected by the treatment.

With this testing procedure it will be possible to obtain distinct differences in germination percentage in a subsequent germination test. The germination percentage of the seed lots after the stress treatment will be used as a basis for ranking the seed lots according to vigour.

In order to find appropriate levels of temperature, moisture content (MC), and duration of the treatment an experiment was carried out with a seed lot of oil seed rape and peas, both seed lots were presumed to be of high vigour.

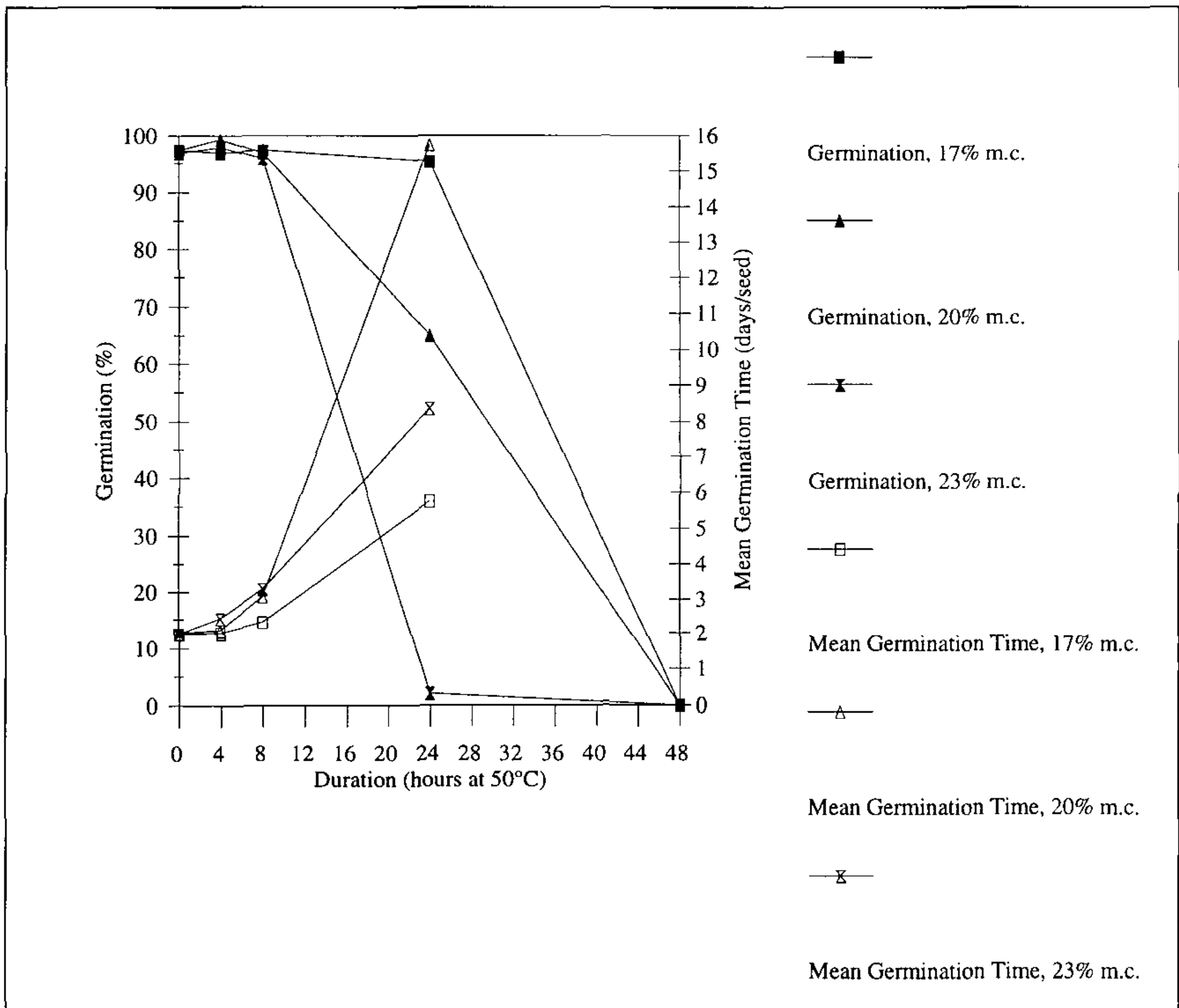


Figure 2. Relationship between germination, moisture content, and storage at 50C in oil seed rape. Germination percentage and mean germination time vs. duration of controlled deterioration.

Samples were treated with factorial combinations of three moisture contents (17%, 20%, 23%), three temperatures (40, 45, 50C) and five durations (0 to 48 h).

Even small changes in temperature as well as in moisture content had a marked effect, as increased temperature and increased moisture content both gave reduced germination percentages and reduced germination speeds, as shown for oil seed rape in Figs. 1 and 2. It is, therefore, important to be accurate when raising the moisture content to the target level, as well as using an accurate temperature in order to give the samples the same level of stress and hence the same degree of deterioration.

On the basis of the preliminary results from various combinations of temperature and moisture content the standard treatment chosen for the vigour test was 20% MC and 45C for both oil seed rape and peas with a 0 to 48 h treatment for oil seed rape

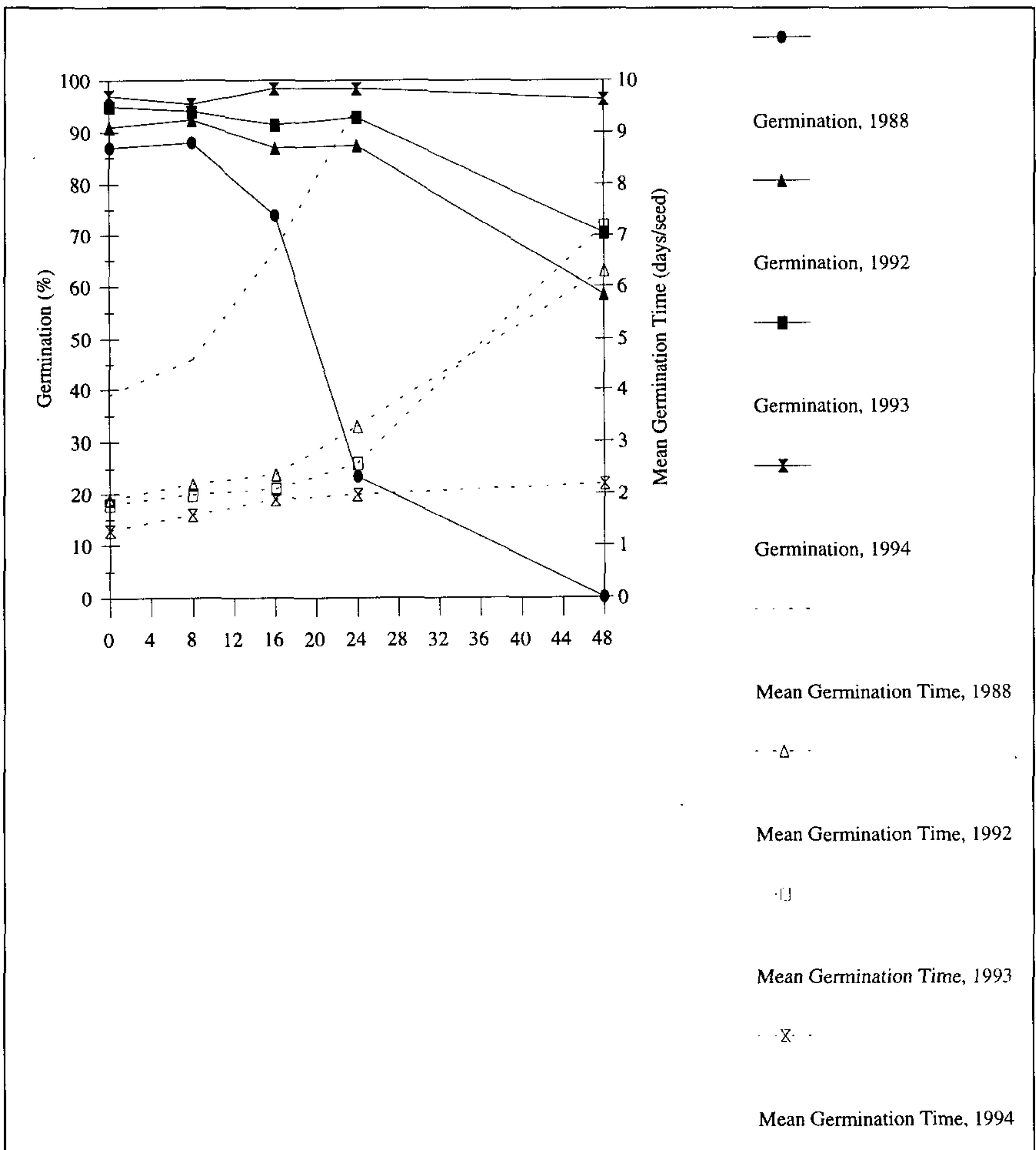


Figure 3. Controlled deterioration of oil seed rape — four seed lots of one cultivar, four different harvest years. Germination and mean germination time vs. duration of controlled deterioration at 45C, 20% MC.

and 0 to 96 h for peas. This standard treatment was applied to seed lots of different cultivars and within the cultivars to seed lots of different ages (naturally aged seeds with expected differences in seed vigour).

All the tested seed lots were sown in the field trials. During the growing season the following factors were evaluated:

- Date of seedling emergence
- Germination percentage
- Development stage
- Plant height
- Date of flowering
- Seed yield

RESULTS

The analysis of the results at present is not finished, but some results for four seed lots of one cultivar of oil seed rape will be presented.

The results of the vigour test of the four seed lots (laboratory results) are shown in Fig. 3. As expected the germination capacity and germination speed after the stress treatment were reduced more for the older seed lots.

Table 1 presents a comparison of results of the vigour test and the field trials for the four seed lots. There was a clear tendency for the oldest seed lot (from 1988) to perform more poorly in the field.

Table 1. Results of the vigour test and the field trials for four seed lots of different ages. All seeds are from one cultivar.

Seed lot (year of harvest)	1988	1992	1993	1994
Germination, standard laboratory test (%)	76	93	97	96
Germination after 24 h of controlled deterioration (%)	23.5	87.5	93	98.5
Field seedling emergence (days from sowing)	20.0	11.75	11.5	10.5
Field germination (% of total number of seeds)	67	76	89	84
Field germination (% of viable seeds)	89	81	91	87
Developmental stage 48 days from sowing (leaves/plant)	3.8	6.0	5.9	6.2
Developmental stage 62 days from sowing (leaves/plant)	6.2	8.2	8.5	8.4
Plant height 62 days from sowing (cm)	32.8	62.9	64.8	64.8

Germination as percentage of viable seeds, i.e. the number of seeds that would be expected to germinate according to the standard germination test, does not show any

obvious difference between the four seed lots. However, when looking at the development of the plants there is an obvious difference. Seeds of the oldest lot germinate more slowly, and even 2 months after sowing, plants of the oldest lot are still smaller and less developed than plants of younger seed lots. The difference is of such a magnitude that a difference in seed yield would appear likely.

These results for oil seed rape show that there may be considerable differences in seed vigour, and that seed vigour is of importance not only for initial plant growth but also for plant development later in the growing season. The results for peas did not show any clear tendencies, possibly because the selected seed lots did not differ markedly in seed vigour.

Since the results of the vigour test showed similar tendencies to the field trials in the ranking of the seed lots, it would appear that the vigour test in combination with controlled deterioration is of use for detecting differences in seed vigour in seed lots of oil seed rape. An analysis of the results, including results for seed yield in the field trials, may confirm this.