Increasing of Seedling Vigour by Thermopriming Method in Rapeseed \((Brassica napus L.\))

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ABSTRACT

In order to determine the impact of thermo priming on germination of rapeseed seeds, an experiment was conducted at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011 by a completely randomized design with three replications. The factors studied included different time thermo priming (0, 10 and 20 minutes) through the placing seeds were exposed to oven. The results showed that the effect of thermo priming was significant on germination percentage, seedling dry weight, seedling vigour and seedling length in \(P \leq 0.05\). Mean comparison showed that the highest germination percentage (94 %), seedling dry weight (0.042 g) and seedling vigour (3.94) were achieved by 10 minutes thermo priming.

Key words: Thermopriming, Seedling, Seedling vigour, Seedling growth and Rapeseed.

Introduction

Canola is certain to shatter seeds, and volunteer plants are a probability the next season. Cereals should follow canola to allow the use of certain broadleaf phenoxy herbicides for control. Production of canola and tame mustard on the same farm should be avoided. A mixture of the two crops reduces the market value of both. In addition, conventional canola should not be planted on fields with heavy infestations of wild mustard. Roundup Ready, Liberty Resistant and Clearfield canola all could be planted on highly infested wild mustard fields. Canola is very susceptible to soil crusting. The seedbed must be firm to seed canola. Seed and soil moisture contact is critical for rapid emergence, so seeding canola into dry soil is not recommended. The seedbed should be prepared in such a manner to minimize wind erosion so seedlings are not damaged by drifting soil. Harrowing canola seedlings is not recommended. Canola varieties produce meals having about 38 percent protein. The amino acid distribution is very complementary to soybean oil meal, and the two meals are often included in the same ration. Feeding trials have shown that animals perform better when fed a mixture of the two meals than when fed either alone. Rape is 70% self-pollinating and 30% cross-pollinated. Even if wind and insects are absent, seed are still produced. Yield increases with honeybees. Competes with alfalfa and clover for insect pollination. Rape honey has slightly less flavor and granulates more easily than clover honey. The oil content runs 35–45%, and oil yields of more than 1 MT/ha is reported. In Canada, Finlayson et al. [2] report yields of only 718 kg/ha in the low-glucosinolate cv 'Bronwskil compared to 1,304 for 'Target'. Yield data for their 1972 trials at Saskatoon were ca 2,960 kg/ha (41.7% oil) for 'Target' ca 2,560 (39.6%) for 'Zephyr', ca 3,010 (44.2%) for 'Midas', ca 2,630 (42.4%) for ISZN71-1788', ca 2,500 (41.7%) for 'SZN71-1787' ca 2,720 (42.3%) for 'SZN71-1785', ca 2,550 kg/ha (41.1% oil) for 'SZN71-1784', nearly all yielding more than a metric ton oil per hectare [2]. Following fungi are known to cause diseases in rape: 


Viruses causing diseases of rape include: Argentine sunflower, Cabbage black-ring, Cauliflower mosaic, Cucumber mosaic, Trinidad cucumber mosaic, Turnip crinkle, Tobacco mosaic, Yellow spot of Nasturtium. Bacterial diseases are caused by Pseudomonas destructans, P. maculicola and
**Materials and Methods**

In order to determine the impact of thermo priming on germination of rapeseed seeds, an experiment was conducted at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011 by a completely randomized design with three replications. The factors studied included different time thermo priming (0, 5 and 10 minutes) through the placing seeds were exposed to oven. After disinfecting, seeds were put in disinfected Petri dish. Each Petri dish contained 100 seeds. Three replicates of 100 seeds were put between double layered rolled. The rolled paper with seeds was put into sealed plastic bags to avoid moisture loss. All of the Petri dish irrigated by distilled water. Seeds were allowed to germinate at 25 ± 3°C for 8 days. Germination percentage was recorded after the 8th day. Germination percentage was calculated with the following formula:

\[ \text{Germination percentage} = \frac{\text{Number of germinated seeds}}{\text{Number of total seeds}} \times 100 \]

Statistics analysis:

Data were subjected to analysis of variance (ANOVA) using Statistical Analysis System (Spss) computer software at P < 0.05.

**Results and Discussion**

**Germination percentage:**

The results showed that the effect of thermo priming was significant on germination percentage in P ≤ 0.05. The highest germination percentage (94 %) was achieved by 10 minutes thermo priming and lowest germination percentage (79 %) was achieved by control treatment (Table 1, Fig 1).

**Seedling dry weight:**

The results showed that the effect of thermo priming was significant on seedling dry weight in P ≤ 0.05. The highest number of grain (0.042 g) was achieved by 10 minutes thermo priming and lowest seedling dry weight (0.031 g) was achieved by control treatment (Table 1, Fig 2).

**Seedling vigour:**

The results showed that the effect of thermo priming was significant on seedling vigour in P ≤ 0.05. The highest seedling vigour (3.94) was achieved by 10 minutes thermo priming and lowest seedling vigour (2.44) was achieved by control treatment (Table 1, Fig 3).

Poor seed germination is a common phenomenon at sub-optimal temperatures which causes a great concern for growers that grow this crop at early spring in cool regions of Iran. Delayed and reduced germination and seedling emergence cause non-uniform stand establishment and tender seedling subjected to soil-borne pathogens for long time. In general, mature seeds tend to show better

**Xanthomonas campestris.** Insects are major pests of rape; sprayings should be planned and official recommendations followed. Fleabees, cutworms, red turnip beetles attack seedlings, and these, along with Diamondback moth, Beet webworm, Bertha armyworm and imported cabbage worm, attack from bud stage until maturity. Red-legged earth mite (Halotydeus destructor), in western Australia, Cutworms (Agrotis spp.); Cabbage moth (Plutella xylostella); Rutherford bug (Nysius vintor); aphids; weevilis (Listoderes costirostris); Cabbage white butterfly (Artogeia rapae); Australian budworm (Helothis punctigera). Nematodes include Ditylenchus dipsaci, Helicotylenchus pseudorobustus, Heterodera crucifera, H. schachtii, Meloidogyne artiellia, M. hapla, M. javanica, M. sp., Nacobbus aberans, Pratylenchus neglectus, and P. penetrans. Fall plowing and preparation of a good firm seedbed is desirable as rape seeds are small. Cultipacking before seeding make a firm even seedbed. Germination must be fast with uniform emergence for the crop to get ahead of the weeds. Seed of Polish and Argentine types germinate readily when moisten and temperature conditions are suitable. Seed rate and spacing of rows varies in different areas. Sow seed with a grain drill, in rows 30–40 cm apart. Because seed are so small, it is recommended to mix 50–50 with cracked grain, so as to spread out the rape seed; for a 10 kg/ha rate, calibrate the drill for 20 kg/ha of mixture. If fertilizer is used mixed with the seed when sowing, sow about 30 kg/ha of mixture and mix at the time of sowing. Seed may be sown with a grass-seed attachment, or broadcast and then harrowed or disced lightly. Depth of sowing should be 2.5 cm or less, but seedlings will emerge from 5 cm or more if soil does not crust on top. Seedlings develop slowly and are easily destroyed by drifting soil. Spreading manure where drifting might start helps trap drifting soil. Early sowings give higher yields, but crop is more susceptible when emerging, -4°C either killing or injuring seedlings, whereas -2°C has no affect when one month old. Sowing in late April or early May is best in northern areas; sowing as late as June or early July gives rather good results. Rape may be planted after grains, flax, corn, potatoes, sugar beets or fallow, but not after rape, mustards or sunflowers [1]. This experiment was conducted to increasing of seedling vigour by thermo priming method in rapeseed (Brassica napus L.).
**Fig. 1:** Effect of thermo priming on germination percentage in rapeseed.

**Fig. 2:** Effect of thermo priming on seedling dry weight in rapeseed.

**Fig. 3:** Effect of thermo priming on seedling vigour in rapeseed.
Table 1: Means Comparison.

<table>
<thead>
<tr>
<th>Treatment (Thermo priming time)</th>
<th>Germination percentage</th>
<th>Seedling dry weight (g)</th>
<th>Seedling vigour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>79\textsuperscript{a}</td>
<td>0.031\textsuperscript{a}</td>
<td>2.44\textsuperscript{a}</td>
</tr>
<tr>
<td>5 minutes</td>
<td>87\textsuperscript{b}</td>
<td>0.038\textsuperscript{b}</td>
<td>3.30\textsuperscript{b}</td>
</tr>
<tr>
<td>10 minutes</td>
<td>94\textsuperscript{a}</td>
<td>0.042\textsuperscript{a}</td>
<td>3.94\textsuperscript{a}</td>
</tr>
</tbody>
</table>

Means within the same column and factors, followed by the same letter are not significantly different.

germination than those of earlier and later harvests, while advancement obtained by priming is greater in earlier harvests (premature seeds). Priming is also a valuable process for improving germination and uniformity of heterogeneously matured seed lots [3]. Seed priming is a presowing seed treatment that improves seed performance by increasing germination rate and uniformity. Priming exposes seeds to imbibition in low external water potentials that allows seed partial hydration [4]. Seed priming may also increase the seed or seedling tolerance to stress. Priming initiates metabolic activities, such as protein, RNA, and DNA synthesis, DNA replication, and b-tubulin accumulation [5]. Recently, it has been suggested that priming could enhance the activity of antioxidative systems, resulting in lower rate of lipid peroxidation, contributing to seed invigoration [6,7]. When seed is allowed to imbibe, the rapidly increasing respiratory activities elevate free radical production, resulting in oxidative stress to cellular components [6,5]. Harris et al. [9] have also reported that overnight priming of seeds with water promoted seedling vigour, yield, and crop establishment of chickpea, maize (Zea mays), and rice (Oryza sativa).

References

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