Effects of Hydropriming on Germination in Rapeseed (*Brassica napus* L.)

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**ABSTRACT**

An experiment was carried out using a completely randomized design with three replications on germination in rapeseed (*Brassica napus* L.) seeds at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011. The factor of study included different time hydro priming (control, 12 and 24 h). The characters measured were: germination percentage, seedling dry weight and seedling vigour. The results showed that effect of hydro priming significant on germination percentage, seedling dry weight, and seedling vigour in P ≤ 0.05. Mean comparison showed that the highest germination percentage (100 %), seedling dry weight (0.046 g) and seedling vigour (4.60) were achieved by 24 h hydro priming.

**Key words:** Hydro priming, Germination percentage, Seedling dry weight, Seedling vigour and Rapeseed.

**Introduction**

Canola (*Brassica napus* L.) varieties have been developed as both spring and winter annuals. The spring type is best adapted to North Dakota conditions. The winter types have not survived consistently in trials in North Dakota, northwestern Minnesota or in the Prairie Provinces of Canada. Canola can be grown on most soil types. It is best suited to clay-loam soils that do not crust. If grown on soil with poor internal drainage, good surface drainage is essential because it cannot tolerate standing water or waterlogged soils. Canola is less tolerant to drought than small-grain crops. It could be considered as a crop to plant on fallow if moisture recharge on recrop land is limited. Canola best follows cereal grains or fallow in rotation. A preferred crop rotation would have canola planted at least two cropping years between plantings. However, if planting canola after one cropping year, we strongly recommend growing a variety that is moderately resistant or resistant to blackleg. Canola is susceptible to sclerotinia stem rot. Infection risk increases if canola is planted closely in rotation with other highly susceptible crops, such as sunflower, dry edible beans or crambe. At least two years should separate canola and sugar beet plantings. If planting canola within three years of susceptible crops, a fungicide application may be needed. Less susceptible crops that could be planted successfully in a close rotation with canola are riced soybeans, flax, semileafless field pea or lentil. In years when ideal environmental conditions favor air-borne movement, all canola plantings without fungicide applied, regardless of rotation intervals, may have economic losses due to sclerotinia. In Europe, ca 1 million MT rape and colza seed are produced per year. One estimate puts the straw associated with such a seed yield at 1.2 million MT (DM). However, another estimate would put the straw yield at 5.8 million MT suggesting a grain: straw ratio of only 0.17 [1]. In three experiments comparing autumn- and spring-sown rape in Britain, seed yields for the spring sown ranged from 963–2,284 kg/ha, for autumn-sown, from 1,787–2,783 kg/ha. Not only did the autumn-sown crop have higher yields, it had a higher oil content (42.0–44.5%) than the spring sown (35.8–38.5%) [2]. Scott et al. [2], indicate aerial DM yields of 1–2 MT with seed yields of about the same magnitude suggesting a straw factor of 1. Rape oil can be used as fuel in diesel engines. A mixture of castor oil and rape oil, with 1% can be used as a lubricant in internal combustion engines. Vegetable oil (safflower, mustard, rape) is better than alcohol as a diesel extender, with mixtures up to 75% vegetable oil possible compared with 20% alcohol. Rape yields of 1500 kg/ha would yield 500 kg oil and 1000 kg high protein meal. One tenth of a farm's acreage can produce energy for the other 9/10 according to some optimistic estimates. The world low production yield was 400 kg/ha in Ethiopia, the international production yield was 856 kg/ha, and the world high production yield was 3,000 kg/ha in Belgium and Luxemburg [3]. The oil content runs 35–45%, and oil yields of more than 1 MT/ha is reported. In Canada, canola meals are recommended for up to 10 percent...
to 20 percent of the ration for chickens, turkeys, ducks, geese, pigs, dairy and beef animals. Edible rapeseed oil or canola oil has been used in some countries for the past two decades and was approved for human consumption in the U.S. by the Food and Drug Administration in 1985. Canola oil usually is blended with other vegetable oils for the production of various solid and liquid cooking oils and salad dressings. Canola oil is high in oleic acid relative to other vegetable oils and has been competitive in price with other cooking oils. Because fruit ripens evenly and shatter easily, to avoid shattering, it is recommended to harvest crop when yellow and windrow to ripen until seed inside is us changing from yellow to brown. Dry, mature seed may be harvested directly with combine. To combine standing crop, it is best to leave the crop until seeds are fully ripe, and with reel speed reduced to two-thirds normal speed for cereals, harvest crop during cloudy weather when plants are moist, thus reducing shattering. In some areas crop is cut by hand and then flailed with sticks after drying in sun for a few days. In humid and temperate regions, artificial drying may be necessary [4]. This experiment was conducted to effect of hydro priming on germination of rapeseed (Brassica napus L.).

Materials and Methods

This experiment was carried out using a completely randomized design with three replications on germination in rapeseed (Brassica napus L.) seeds at Islamic Azad University Shahr-e-Qods Branch, Tehran, Iran in 2011. The factor of study included different time hydro priming (control, 12 and 24 h) through the placing seeds was exposed to water. 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:

Germination percentage = Number of germinated seeds / Number of total seeds × 100

Also, Seedling vigor index was calculated by the following formula:

Seedling vigor index = Germination percentage × Seedling dry weight

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 hydro priming was significant on germination percentage in P ≤ 0.05. The highest germination percentage (100 %) was achieved by 24 h hydro priming and lowest germination percentage (81.33 %) was achieved by control treatment (Table 1, Fig 1).

Seedling dry weight:

The results showed that the effect of hydro priming was significant on seedling dry weight in P ≤ 0.05. The highest number of grain (0.046 g) was achieved by 24 h hydro priming and lowest seedling dry weight (0.039 g) was achieved by control treatment (Table 1, Fig 2).

Seedling vigour:

The results showed that the effect of hydro priming was significant on seedling vigour in P ≤ 0.05. The highest seedling vigour (4.60) was achieved by 24 h hydro priming and lowest seedling vigour (3.17) was achieved by control treatment (Table 1, Fig 3).

Likewise Asgedom and Becker [5] reported that some or all processes that precede the germination are triggered by priming and persist following the re-desiccation of the seed. The improved yield of primed seed plots may be due to early and improved emergence in the priming treatments that ultimately resulted in the higher yield. The resulting improved stand establishment due to priming can reportedly increase drought tolerance, reduce pest damage and increase crop yield [6,7,8]. The increase in yield of primed seed plots may be due to the fact that primed seed emerge faster and more uniformly and seedlings grow more vigorously, leading to a wide range of phenological and yield related benefits [7]. Harris et al., [6] further reported that primed crops produced higher yields than non primed crops. 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. Seed maturation stage is an influential factor on germination performance in response to priming [9,10]. In general, mature seeds tend to show better germination than those of earlier and later harvests, while advancement obtained by priming is greater in earlier harvests (premature seeds).
**Fig. 1:** Effect of hydro priming on germination percentage in rapeseed.

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

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

<table>
<thead>
<tr>
<th>Treatment (Hydro 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>81.33 *</td>
<td>0.039 *</td>
<td>3.17 *</td>
</tr>
<tr>
<td>12 h</td>
<td>93 *</td>
<td>0.043 *</td>
<td>3.99 *</td>
</tr>
<tr>
<td>24 h</td>
<td>100 *</td>
<td>0.046 *</td>
<td>4.60 *</td>
</tr>
</tbody>
</table>

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

References

4. Reed, C.F., 1976. Information summaries on 1000 economic plants. Typescripts submitted to the USDA.