Study of Effects of Different Planting Dates on Oil Percentage, Protein Percentage and Some Agronomic Traits of Soybean Cultivars in Cold Region of Ardabil

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ABSTRACT

In order to study the effects of different planting dates on oil yield, oil percentage and protein of soybean cultivars, an experiment was conducted as factorial in the form of randomized complete blocks design with three replications at the research farm of Islamic Azad University of Ardabil in 2009. In this experiment, the first factor of planting date including four levels (27 May, 5, 15 and 26 June) and the second factor including cultivar Williams and line L17. The results showed that there was not meaningful difference between under-studies cultivars for all traits, while there was meaningful difference between different planting dates for all traits studied. Also, the interaction of planting date and cultivar was not meaningful for all under-study traits. Planting dates of 27 May and 5 June were placed in one group for height of the first of gravid node from ground surface, oil percentage and protein. Also the mentioned traits had the highest in the expressed planting dates. Planting date of 27 May had the highest value for one-plant yield and oil yield. The results obtained show that the plant does not reach its potential ability due to delaying to sow soybean because of dealing with inappropriate conditions, so the yield is reduced. Hence, planting date of 27 May recommended for planting soybeans in Ardabil cold climate.

Key words: protein and oil percentage, planting date and soybean.

Introduction

Oil consumption per capita increased from about 2.5 kg/yr in 1961 with 20 million population of the country to 16.5 kg in 2005 with 70 million populations. So considering that over 85 percent of the country's oil requirements are supplied through imports, and every year a significant share of the budget share of the country consumed for buying oil and byproducts of oil seeds such as meal, increasing of oil seed production is very important in the country. Country's oil consumption rate is announced about 1,072,017 tons in 2002. Of this, 8.8 percent are supplied from domestic production and the rest are supplied from imports (Assadi and Faraji, 2009). Planting date affect significantly on different stages duration of growth as one of the important farming issues, and it is one of the important factors to determining harvest of maximum cultivar yield in one region. Appropriate planting date causing optimal utilization of the climate factors such as temperature, humidity, day length and also anthesis time adaptation with proper temperature [7]. The purpose of determining planting date is to find the best time.
for planting cultivar or group of cultivars in such that environmental factors set occurs at the time for are suitable for emergence, seedling establishment and survival and have optimal conditions in each stage of plant growth or have not faced with unfavorable environmental conditions [9]. Robinson [13] found that to achieve maximum oil yield, the planting date should be selected in which the maximum yield is achieved.

According to existing studies that show potential facilities in soybean production in Iran is far too much that is currently exist, it is essential to perform more researches in different fields on this plant. Hence this study was conducted to assess the best planting date and cultivar in the region to possibly be in the region periodic cycles.

Materials and methods

This experiment was conducted on research farm of Islamic Azad University of Ardabil in 2009 (Ardabil West 5 km). The climate is semi-arid and cold, winter temperatures were often below zero degrees. Altitude was 1350 meters and latitude and longitude were 38.15 norths and 48.2 easts, respectively. Average annual minimum and maximum temperature and maximum absolute temperature were -1.98, 15.18 and 21.8 ° C, respectively, and mean annual precipitation have been reported 310.9 mm. The experiment soil was clay alluvial soils; its acidity varies between 8.2-7.8. The experiment was conducted as factorial in the form of randomized complete blocks design with three replications, the first factor of planting date including four levels (27 May, 5, 15 and 26 June) and the second factor including cultivar Williams and line L_{17}. Substrate preparation operations include plowing, disk, leveling and preparing the bed. During bed preparation, based on soil test the amount of 30 kg urea per hectare was used on the farm. Cultivars prepared from the Research Center of Moghan and after disinfection and inoculation by *Rhizobium Japonicum* bacteria were cultivated on the desired dates. Each plot contains six planting rows with 4m length and the spacing between planting rows was 50 cm and the plant distance was considered 8 cm. During the growth period the farm was irrigated each 10 days. During this period to control weeds three times weeding was done manually. When maturity of the product, from the effective level of each experimental unit, initially 10 plants were randomly harvested and one-plant yield and height of the first node pregnant from ground surface were measured. Oil and protein percentage was calculated by the oil and protein analysis system in the laboratory. Oil yield was obtained by multiplying seed yield with oil percentage per unit area. Statistical calculations and comparison of averages were performed using SPSS software. To compare means, we used Duncan's multiply range test in probability level of 5%.

Results and discussion

**Height of First Gravid Node:**

According to the results obtained from data variance analysis on the height of the first gravid node, it was observed that except planting date effects, there was not meaningful difference between other effects in probability level of 1 % (Table 1). Data mean comparison showed that planting date of 27 May and 5 June had the highest height of node from the ground surface and also it was not observed meaningful difference between planting dates of 15 June and 26 June for this trait (Table 2). Delaying planting, height of first pod from ground level is reduced. Apparently, temperature and day length variations that reduce plant height due to reduction of internodes distances, were led to lower pods to be formed near the surface and thus the first pod height from the ground reduced. The main factor to make difference in height of first pod from ground surface in different planting dates is difference between duration of growth period and ripeness of cultivars with different maturity groups [7].

**One-plant yield:**

Cultivar effects and cultivar interaction with planting date on above trait had no meaningful effect, while repetition and planting date were meaningful in probability levels of 5% and 1%, respectively (Table 1). Mean comparison between different planting dates show the greatest amount for one-plant yield is related to planting date of 27 May and the lowest is related to planting dates of 15 June 26 June (Table 2). Khadem Hamzeh et al [8] expressed that in their experiments; one-plant yield in the first planting date was 8 and 36 percent more than the second and third planting dates, respectively, which is compatible with results of this experiment.

**Oil percentage:**

Results obtained from data variance analysis (Table 1) showed that the effects of planting dates on oil percentage had meaningful effect in probability level of 1%, so that it was not observed meaningful difference between other effects. Data mean comparison (Table 2) on this trait showed the highest oil percentage is related to planting date of 27 May with 18.50 percent and there was not meaningful difference for this trait between planting dates of 27 May and 5 June and also between 5 and 15 June and 26 June. Azizi et al [2] reported that the amount of seed
oil influenced by of planting date and cultivar, but the interaction of planting date and cultivar on seed oil content was not meaningful. They also stated that the average seed oil was more on the first planting and the third planting date had the lowest seed oil amount and there was meaningful difference for oil amount between all three planting dates. Delay in planting may lead to reducing the amount of oil [4], Eagle and Brueing [6] and Pope et al [10]. Delay in planting are reduced grain yield, crop growth rate and oil [16]. Oil percentage will be increased by increasing temperature. With delay in planting due to collision with maturity periods of low oil temperature is reduced [2]. Si and Walton [15] reported for each two week delay in planting canola in Western Australia, approximately 1 / 1 percent of oil and 309 kilograms per hectare yield is reduced. Saidi and Khoddam Bashi (2006) with linseed reported on their experiments, the delay in planting caused early plants and clay seed oil can be reduced. The findings (Saidi, 2002) conform. [11] expressed the highest on the first planting and planting on the lowest end of the canola seed oil produced. Bagheri et al [3] stated that they tested their genotypes in terms of significant amount of oil was not found.

### Oil yield:

Results of analysis of variance on oil yield showed that the interaction between the effects of cultivars with planting date there is no significant difference in spite of their effects on planting significant difference in the 1 percent level indicated (Table 1). Comparison on this trait showed that planting on the 27 May produced the highest oil yield and oil yield minimal 26 June planting date was assigned (Table 2). Oil yield per unit area is multiplying grain yield per unit area and oil percentage. Rezvani Moghaddam et al., [12] in their study had a speech on Castor; they only affected by planting date. Among the different planting dates, first planting date on the highest oil yield have produced the above results are consistent. There is positive correlation between oil yield and oil percentage yield. In early planting dates seed yield and oil percentage showed increase compared with late planting dates. So oil yield increase is justifiable in these planting dates. Cultivars which have high yield have high oil yield in level unit [14,1].

### Table 1: Analysis of variance for the traits evaluated on different planting cultivar Williams and Line L17

<table>
<thead>
<tr>
<th>Source of Variations</th>
<th>df</th>
<th>On-plant yield</th>
<th>Height of first gravid node</th>
<th>Oil percentage</th>
<th>Protein percentage</th>
<th>Oil yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block</td>
<td>2</td>
<td>22.29**</td>
<td>0.19**</td>
<td>0.20**</td>
<td>0.29**</td>
<td>8841.8**</td>
</tr>
<tr>
<td>Planting date</td>
<td>3</td>
<td>215.43**</td>
<td>23.87**</td>
<td>61.47**</td>
<td>41.1**</td>
<td>69537.2**</td>
</tr>
<tr>
<td>Cultivar</td>
<td>1</td>
<td>5.13</td>
<td>0.18 ns</td>
<td>0.81 ns</td>
<td>9.13**</td>
<td>421.8**</td>
</tr>
<tr>
<td>P*C</td>
<td>3</td>
<td>1.59**</td>
<td>0.23**</td>
<td>0.21**</td>
<td>0.49**</td>
<td>215.08**</td>
</tr>
<tr>
<td>Error</td>
<td>14</td>
<td>3.79</td>
<td>0.17</td>
<td>0.66</td>
<td>7.07</td>
<td>1366.1</td>
</tr>
<tr>
<td>CV (%)</td>
<td></td>
<td>21.10</td>
<td>14.49</td>
<td>5.60</td>
<td>6.22</td>
<td>13.23</td>
</tr>
</tbody>
</table>

* and ** Significantly at p < 0.05 and < 0.01, respectively

### Table 2: Comparison of Means traits on different planting cultivar Williams and line L17

<table>
<thead>
<tr>
<th>Characters</th>
<th>27-May</th>
<th>5-Jun</th>
<th>15-Jun</th>
<th>26-Jun</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-plant yield(gr)</td>
<td>16.77a</td>
<td>11.32b</td>
<td>4.81c</td>
<td>4.03c</td>
</tr>
<tr>
<td>Height of first gravid node(cm)</td>
<td>7.81a</td>
<td>7.23a</td>
<td>3.96b</td>
<td>4.23b</td>
</tr>
<tr>
<td>Oil percentage</td>
<td>18.50a</td>
<td>15.98ab</td>
<td>12.33b</td>
<td>11.67b</td>
</tr>
<tr>
<td>Protein percentage</td>
<td>36.32a</td>
<td>40.25ab</td>
<td>41.37b</td>
<td>41.03b</td>
</tr>
<tr>
<td>Oil yield (kg/ha)</td>
<td>410.9a</td>
<td>318.8b</td>
<td>219.6c</td>
<td>168.2d</td>
</tr>
</tbody>
</table>

Differences between averages of each column which have common characters are not significant at probability level of 5%.

### Protein percentage:

Results obtained from data variance analysis on protein percentage showed that there was meaningful difference between effects of planting dates on this trait in probability level of 1 percent, but among other effects, cultivar and interaction on plant cultivar, meaningful difference was not seen (Table 1). Data mean comparison on this trait showed that the lowest protein percentage is related to planting date of 26 June with 36.32 percent and there was not meaningful difference between planting dates of 27 May and 5 June and also 5 and 15 June and 26 June (Table 2.) Dadashi and Khajehpour [5] reported the third planting date was the highest and planting the fourth planting date was the lowest percentage of seed protein. There was not any relation ship between protein and oil percentage, but protein percentage of seed showed reverse relationship with seed yield. In this review, differences between cultivars from seed protein were negligible.

### Conclusions:

According to the results, it was observed that delaying planting due to the loss of suitable time for the growth, the plant is not achieved its potential ability and so this leads to yield decrease. Hence,
planting date of 27 May recommended for planting soybeans in Ardabil cold climate.

References