Effect of Sowing Date and Different Planting Management, on Seed Yield and Yield Components of Safflower in Isfahan Region

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ABSTRACT: In order to evaluation of sowing date and different planting management, on seed yield and yield components of safflower, an experiment was conducted in 2010-2011 in a research farm of farming building of Islamic Azad University Khorasgan (Isfahan) Branch located in Khatun abad village (latitude 32° /40’ N and Longitude 51° /48’ E). A split split plot layout within randomized complete block design with 3 replications was used. Main plot were sowing date (Including: 18 Mar, 5 Apr and 27 Apr), and sub plots were seed mass (with 3 different planting management), and groups emerged were as split plots. Condition represented the effects of sowing date, seed mass and groups emerged were significant on all measured factors. First planting date (18 Mar), Second seed mass and first groups emerged resulted the maximum level of all mentioned factors. On the basis of the results obtained, 18 Mar might be suitable for safflower sowing date in Isfahan region, under the condition similar to the present study.

key words: Safflower, Sowing date, Planting management, Seed yield.

INTRODUCTION

Safflower (Carthamus tinctorius L.) is an annual, broadleaf oilseed crop of the family compositae adapted mainly to dry land and irrigated cropping systems (Rohini and Sankara., 2000). In Iran the safflower cropped area has increased over last few years and reached about 10000 ha during 2008 whereas during 1997 it was 200-300 ha (Omidi et al., 2009). The planting date is the first central point in management decisions for crop production, especially in regions which have environmental constrains such as late or early cold at the beginning and end of season and intense heat of mid-summer. Delay in planting result in decrease of dry matter, grain yield and its quality due to reduction of amount of received sun radiation by canopy (Jose et al., 2004). Ozel, (2004) showed that the most suitable sowing date and intra row spacing for safflower on Harran Plain were November and 5 cm, respectively. One of the most important aspects for safflower seed production is related to rapid emergence and good seedling establishment in the field. In the other hand germination and emergence are important issues in plant production and they have significant effect on the next stages of plant growth in the field. Traits that are in relation to seed size are important in agronomy (Siddiqi et al., 2007). Rapid and uniform field emergence is essential to achieve high yield with good quality and quantity in annual crops (Yari et al., 2010). A suitable combination of planting management and sowing date is the most important factor in acquiring economic yield. So in order to increase the exploitation of environmental facilities for increasing the crop production, it is necessary to pay attention to historical background of plants cultivation in regions and their compatibility with special environmental conditions. Isfahan is one of the areas in Iran that has the capability for safflower cultivation. This research was done with purpose of studying the impacts of planting date and planting management in Isfahan climatic conditions on growth and yield of safflower.

MATERIALS AND METHODS

An experiment was conducted on the basis of split split plot layout with completely randomized block design with 3 replications. Main plot were sowing date (Including: 18 Mar, 5 Apr and 27 Apr), and sub plots were seed mass (with 3 different planting management), and groups emerged were as split plots. This research was conducted in 2010-2011, at research farm of farming building of Islamic Azad University Khorasgan (Isfahan) Branch located in Khatun abad village (latitude 32° /40’ N and Longitude 51° /48’ E). Soil texture was silty clay. Long term average precipitation was 120 mm. The soil preparation consisted of mouldboard ploughing (25-30 cm) followed by discing and smoothing with a land leveler. On the basis of soil analysis, fertilizers needed in planting time were used. Other normal agronomic practices for maize production were followed. In each plot, 4 lines were used, the planting lines number 1 and 4 and also 0.5 meter from start and end of lines were omitted and the length of each line was 5 meter. Planting on three dates: March 18, April...
5 and April 27 was done manually. Emerged seedlings in each planting date were counted on a daily basis. Number of heads per plant, number of seeds per head, 1000 seed weight (g), seed yield (kg ha$^{-1}$), biological yield (kg ha$^{-1}$) and harvest index (%), was measured. Mstat-C software and mean comparison with Duncan’s test in 5% probability was used.

RESULTS AND DISCUSSION

Sowing date had significant influence on number of heads per plant, number of seeds per head, 1000 seed weight, seed yield, biological yield and harvest index (Table 1). Mirzakhani et al. (2002) noted in their research on safflower, that traits such as number of sub-shrubs per plant, number of capitul per plant, number of seeds per capitul and plant height had a significant decrease in the delayed planting date than the first planting date. They concluded number of sub-shrubs, number of capitul per plant, number of seed per capitul, percentage of cold damage and seed yield that affected by different planting dates, became significant. Also, effect of seed mass and groups emerged were significant on number of heads per plant, number of seeds per head, 1000 seed weight, seed yield, biological yield and harvest index (Table 1). Germination and emergence are important issues in plant production and they have significant effect on the next stages of plant growth in the field. Traits that are in relation to seed size are important in agronomy (Siddiqi et al., 2007).

No. of heads per plant

The highest of No. of heads per plant was achieved in first planting date (18 Mar), but had no significant differences between 5 Apr. The lowest No. of heads per plant related to 27 Apr sowing date. Second seed mass has highest No. of heads per plant but had no significant differences with third. The lowest No. of heads per plant related to first seed mass. Also, the highest of No. of heads per plant was achieved in first groups emerged and has significantly different from other treatments, but the lowest of it related to third groups emerged (Table 2).

No. of seeds per head

The highest No. of seeds per head was achieved in first planting date (18 Mar), Second seed mass and first groups emerged, and has significantly different from other treatments, but the lowest of it related to third planting date, seed mass and groups emerged (Table 2).

1000 seed weight

The highest of 1000 seed weight was achieved in first planting date (18 Mar), Second seed mass and first groups emerged, and has significantly different from other treatments, but the lowest of this factors related to 27 Apr sowing date but had no significant differences between 5 Apr. Robertson et al., (2004) concluded that delay in planting date reduced the 1000-grain weight and its yield.

Seeds yield and biological yield

The highest of seed yield and biological yield was achieved in first planting date (18 Mar), and had significantly different from other treatments, but the lowest of this factors related to 27 Apr sowing date but had no significant differences between 5 Apr. Second seed mass has highest of seed yield and biological yield, and has significantly different from other treatments. Also, the highest of seed yield and biological yield was achieved in first groups emerged and has significantly different from other treatments, but the lowest of it related to third groups emerged (Table 2). Bagawan and Ravikumar (2001), reported a positive correlation between number of heads per plant and grain yield Johnson et al. (2001), indicated that grain yield was positively correlated with seed weight and plant height.

Harvest index (HI)

The highest of HI was achieved in first planting date (18 Mar), and had significantly different from other treatments, but the lowest of this factors related to 27 Apr sowing date. First seed mass has highest of HI and had significantly different from other treatments. The lowest of it related to third seed mass but had no
significant differences between second seed mass. Also, the highest of HI was achieved in second groups emerged but had no significant differences with third. The lowest of it related to first groups emerged and had significantly different from other treatments (Table 2). Ozer (2003), related the low grain yield of safflower in late planting date to reduced number of sheath in plant and harvest index.

Table 2. Mean comparison for No. of heads/plant, No. of seeds/head, 1000-seed weight (g), seed yield (kg ha$^{-1}$), biological yield (kg ha$^{-1}$), HI (%).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of heads/plant</th>
<th>No. of seeds/head</th>
<th>1000-seed weight</th>
<th>Seed yield</th>
<th>Biological yield</th>
<th>HI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing date</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>date 1 (18 Mar)</td>
<td>49.58a</td>
<td>31.97a</td>
<td>31.50a</td>
<td>50.91a</td>
<td>158.57a</td>
<td>32.17a</td>
</tr>
<tr>
<td>date 2 (5 Apr)</td>
<td>45.22ab</td>
<td>29.15b</td>
<td>27.81b</td>
<td>36.60b</td>
<td>117.73b</td>
<td>31.07b</td>
</tr>
<tr>
<td>date 3 (27 Apr)</td>
<td>44.27a</td>
<td>26.01c</td>
<td>27.01c</td>
<td>32.34b</td>
<td>112.47c</td>
<td>28.95c</td>
</tr>
<tr>
<td>Seed mass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed mass 1</td>
<td>43.92b</td>
<td>27.98b</td>
<td>28.42b</td>
<td>35.93b</td>
<td>114.81b</td>
<td>31.08a</td>
</tr>
<tr>
<td>Seed mass 2</td>
<td>48.90a</td>
<td>31.77a</td>
<td>29.98a</td>
<td>48.12a</td>
<td>156.60a</td>
<td>30.57b</td>
</tr>
<tr>
<td>Seed mass 3</td>
<td>46.25ab</td>
<td>37.27c</td>
<td>27.92c</td>
<td>35.80b</td>
<td>117.37b</td>
<td>30.53b</td>
</tr>
<tr>
<td>Groups emerged</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 1</td>
<td>54.92a</td>
<td>30.53a</td>
<td>30.63a</td>
<td>51.90a</td>
<td>171.14a</td>
<td>30.21b</td>
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<tr>
<td>Group 2</td>
<td>43.86b</td>
<td>29.75b</td>
<td>27.89b</td>
<td>37.28b</td>
<td>119.03b</td>
<td>31.01a</td>
</tr>
<tr>
<td>Group 3</td>
<td>40.26c</td>
<td>26.84c</td>
<td>25.80c</td>
<td>30.67c</td>
<td>98.61c</td>
<td>30.95a</td>
</tr>
</tbody>
</table>

Common letters within each column do not differ significantly.

CONCLUSION

According to results of the present study, the plant yield has a direct relationship with length of growth period. One of the reasons for yield decrease in delayed planting date, is the decrease in length of growth period through acceleration of maturation time. Delay in planting result in decrease of dry matter, grain yield and its quality due to reduction of amount of received sun radiation by canopy (Jose et al., 2004). Among other important reasons for reducing grain yield in delayed planting date are reduction of canopy area and short length of vegetative period (Hocking and Stapper., 2001).

Then, on the basis of the results condition represented the effects of sowing date, seed mass and groups emerged were significant on all measured factors. First planting date (18 Mar), Second seed mass and first groups emerged resulted the maximum level of all mentioned factors, this finding is in agreement with other reports suggesting that the planting date of 18 Mar, might be suitable for safflower productive under the condition similar to the present study.

REFERENCES


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