

EFFECT OF SOWING DATE AND APPLICATION TIME OF NITROGEN FERTILIZER ON AGRONOMICAL TRAITS OF SPRING RAPESEED IN IRAN COLD REGIONS

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ABSTRACT:

Rapeseed is one of the oil plants that today because of the extent of compatibility, cultivated in many parts of the world and most used in the edible oil supply in Europe and other parts of the world. Sowing date and plant nutrition are very important in colza cultivation, so research for nomination the best sowing date and nutrition for every region in world is need. So in order to study the effect of various sowing date and different application times of nitrogen fertilizer on growth indices, agronomical traits and yield of spring colza(RGS cultivar) in Fridonshahre Agriculture Research in 32° 56' N latitude and 50° 16' E altitude with 10 centigrade annual temperature as a cold region in Iran an experiment was conducted in the end of April 2008. Experimental treatments were include in three sowing date(Mar. 13, Mar. 23, Jun. 2) as main plots and three nitrogenous fertilizer time application (total in sowing time, half sowing time and half end of rosette, third sowing time- third rosette- third start of flowering) as sub-plots in a split-plot on randomized complete block design with three replications. In this study traits included LAI, TDM, CGR every 10 day interval measurement, also in physiological maturity time plant height, number branch per plant, number silique per plant, grain1000 weight, grain yield, seed oil rate , oil and protein yield were measurement. The results showed that sowing date had a significant effect on grain yield, seed oil percentage and protein yield. Grain yield in Mar. 13 planting date was about 2500 kg/ha that was significantly higher than others planting date with about 1600 and 1400 kg/ha in Mar. 23 and Jun. 2 respectively. Also seed oil percent with about 39 percent in soon date planting was significantly higher in later planting date with about 34 and 28 percent in Mar. 3 and Jun. 2 respectively. Protein yield too in the soonest sowing date with 600 kg/ha was significantly higher than two other planting dates with about 350 and 280 kg/ha in Mar. 23 and Jun. 2 respectively. Nitrogen treatments had a significant effect on grain yield, seed oil and protein percentage and number silique per plant. Grain yield in application fertilizer in three section was about 2500 kg/ha that was significantly higher than others application time with about 1400 and 1600 kg/ha in one and two time fertilizer application respectively, Also seed oil percentage in application fertilizer in three time was about 40 percent that was significantly higher than others application time with about 27 and 35 kg/ha in one and two time fertilizer application respectively. Protein yield in application fertilizer in three section was about 580 kg/ha that was significantly higher than others application time with about 270 and 340 kg/ha in one and two time fertilizer application respectively. Number silique per plant in application fertilizer in three time was about 95 silique per plant that was significantly higher than others application time with about 50 and 65 silique per plant in one and two time fertilizer application respectively.

Key Word: Rapeseed, Colza, Sowing Date, Plant Nutrition, Nitrogen Fertilizer

INTRODUCTION

The plants are the most important sources of oil and protein for humans and animals nutrition. Winter oilseed rape (*Brassica napus* L.) is the most important of oilseeds and has potential to become an alternate oilseed crop in Central, Iran. Rapeseed (*Brassica napus* L.) is widely grown as an oilseed crop in the world, but has a very limited acreage in Iran. The most of land of Isfahan and Chaharmahal va Bakhtyari have a cool and short growing season, where the oilseed crops usually perform poorly

except rapeseed. Rapeseed is a new and promising oilseed crop for this region. In these regions the information on sowing dates of rapeseed is an important step for the forecast of the rapeseed yield (Miralles, et al 2001).

Sowing date and plant nutrition are very important in colza cultivation, so research for nomination the best sowing date and nutrition for every region in world is need. Nitrogen is a nutritive element required by plants in large amounts while its use efficiency is always slow in dry land regions, which has become one of the most nutritional-limiting factors for increasing crop yield and improving crop quality in China and Asia (Li 2007). In addition to supplying a nutrient for plant growth, N application could improve drought tolerance of plants to enhance yields (Zaman and Das 1991, Xu et al. 2005). Furthermore, nitrogen plays an important role in the antioxidant defense enzyme and lipid peroxidation metabolism of crops under stress (Saneoka et al. 2004).

An important management factor in the production of all crops is planting date. Planting date is critical in cold climates due to the potential for frost damage both early and late in the season in rape cultivation (Johnson et al., 1995). Johnson et al. (1995) showed that high temperatures at the end of the growing season can also reduce yields. Morrison and Stewart (2002) observed that flowering of rape is inhibited above 27°C. Therefore, in the desert southwest, planting date may be important to avoid high temperatures at the end of the growing season. Environmental factors greatly affect plant growth and yield. Sowing date is an important determinant of crop yield. Sowing date depends on the onset of significant rainfall, temperature and humidity of a region. Decreasing crop yield in delayed sowing date has been reported by many workers (McDonald et al., 1983).

Available nitrogen and proper sowing data are the most important factors affecting seed yield of oilseed rape. Rollier (1970) reported on maximum uptake of nitrogen being at the rosette stage in winter oilseed rape is supported by Holmes (1980), although Anderson et al. (1958) found maximum nitrogen uptake in winter oilseed rape to be at 220 kg ha⁻¹. Optimal spring top-nitrogen rate ranged from 120 to 240 kg ha⁻¹ of N (Sieling et al., 1999). Almost all investigations showed that nitrogen fertilizers gave substantial oilseed rape seed yield increases even in diverse and contradicting conditions (Maroni et al. 1994, Sieling and Christen 1997). However, fertilizer nitrogen requirements can differ very much according to soil type, climate, management practice, timing of nitrogen application, cultivars and etc. (Holmes and Ainsley 1977, Kalkafi et al. 1998).

MATERIALS AND METHODS

The effect of various sowing date and different application times of nitrogen fertilizer on growth indices, agronomical traits and yield of spring colza(RGS cultivar) in Fridonshahre Agriculture Research in 32° 56' N latitude and 50° 16' E altitude with 10 centigrade annual temperature as a cold region in Iran were conducted in the end of April in the year 2008. Experimental treatments were include in three sowing date(Mar. 13, Mar. 23, Jun. 2) as main plots and three nitrogenous fertilizer time application (total in sowing time, half sowing time and half end of rosette and third sowing time-third rosette- third start of flowering) as sub-plots in a split-plot on randomized complete block design with three replications. Research was conducted in a silty clay loam soil . Land preparation practices included plowing, disking and ridging plots (sized 4 by 4 m). Weeds were controlled by Triflouralin (2 L ha⁻¹) that was applied prior to planting and incorporated into soil by disking. Nitrogen was supplied from urea and added to plots according time treatments. The seeds of rapeseed cv RGS were sown in plots by Pneumatic grain drill (model Accord, Germany) in time treatments. To reach exact plant density plant thinning was performed at 5 leaf growth stage. Some traits such as LAI, TDM, CGR every 10 day interval measurement, also in physiological maturity time plant height, number branch per plant, number silique per plant, grain1000 weight(g), grain yield(kg/ha) were measurement.

RESULTS AND DISCUSSION

Data on monthly average temperature years of study of the region shown in Figur 1.

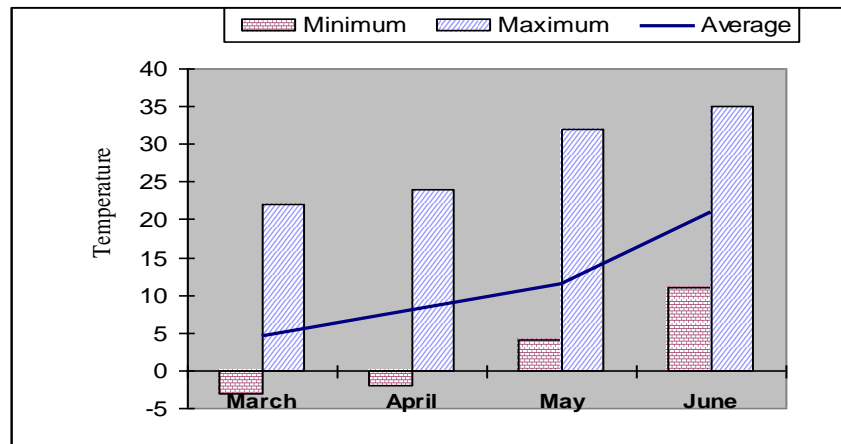


Figure 1 . Meteorological data (temperature C°) for the experimental site during the experimental periods(2008)

Branch numbers per Plant:

Results indicated that plant sowing had significant effects on branch number per plant but nitrogen time use had no significant effects on branch number. First plant sowing produced the highest branch number (3.5). Increasing in Branch numbers with early sowing observed by Patil et al. (1996) for rapeseed cultivars.

The nitrogen and plant sowing interaction had no significant effects on branch number.

Pod Number per Plant (PNPP):

Results exhibits that different nitrogen time use had highly significant effect on PNPP. Maximum PNPP (100) were obtained in plots that received N in three time application. The minimum PNPP (52) was produced in one time application of N. Similar results were also reported by other researchers (Khan et al., 2002; Sidlauskas and Tarakanovas, 2004). They showed that pod number per plant would be increased in nitrogen time application.

Number Seeds Per Pod:

Significant differences were recorded in number of seeds per pod among various date sowing and nitrogen treatments. Maximum (330.9) were produced at first date sowing. These results are in agreement with the findings for soybean by Ball et al. (2000) and for colza by Fathi et al. (2002).

1000-Seed weight:

Results showed that the 1000-weight seed increased with increasing in time nitrogen application and early sowing. Thus, the highest and lowest values of this trait were obtained from 3.70 and 2.90 g in three and one time application N respectively. The interaction effects of nitrogen and plant sowing had no significant effect on 1000-Seed weight. These results are supported by Trivedi and Singh (1999).

Plant height:

Results showed that the nitrogen time application and sowing date had significant effects on the plant height. The three time application N treatment produced the maximum plant height (113.0 cm), followed by two time application N treatment which plant height was 120. The minimum plant height was recorded in one time application N treatment. These results are in line with the findings of Ali et al. (1990) who reported that plant height was maximum with increasing nitrogen time application.

The interaction effects of nitrogen and sowing date had no significant effect on plant height.

Grain yield:

Result indicated that nitrogen application time, plant sowing date and their interaction had significant effect on seed yield. Rapeseed seed yield varied from 2500 to 1400 kg/ha, with the highest and lowest seed yields at three and one time nitrogen application respectively. The difference between the lowest and the highest seed yields was 1100 kg/ha. Present results support the previous study of Ali et al. (1990) who reported that use of nitrogen could increase rapeseed seed yield. Yousaf and Ahmad (2002) and Fathi et al. (2002) indicated that increasing nitrogen fertilizer caused a boost in seed yield in rapeseed.

CONCLUSION

Increase of N time application and plant early sowing significantly affected some important growth, yield and yield components in rapeseed. An increase in plant height, number of branches and 1000 seed weight. to be observed in both multiple nitrogen time application and early sowing. According to the our results, application of N in three time and sowing in mid of March for the maximum yield recommended at the experimental site condition and all regions with same condition.

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