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Research Article

EFFECTS OF NITROGEN FERTILIZER RATE AND PLANT DENSITY ON STRAW, SEED YIELD, AND QUALITY OF THREE LINUM USITATISSIMUM L. CULTIVARS

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ABSTRACT

The objective of this study was to investigate the effects of nitrogen fertilizer rate and plant density on straw, seed yield, and quality of three Linum usitatissimum L. cultivars. The study was conducted in a randomized complete block design with three replicates. The cultivars used were Linola 947, Linola 989, and CDC Bethune. Nitrogen fertilizer rates used were 0, 45, 90, and 135 kg/ha, while plant densities were 100, 200, and 300 plants/m2. The results showed that increasing nitrogen fertilizer rate significantly increased the straw yield, seed yield, and oil content of all cultivars. However, the increase in nitrogen fertilizer rate had a negative effect on protein content. Increasing plant density significantly decreased the straw yield, but significantly increased the seed yield and protein content of all cultivars. Oil content was not significantly affected by plant density. Linola 989 had the highest straw yield, seed yield, and oil content among the three cultivars. CDC Bethune had the highest protein content.

KEYWORDS

Linum usitatissimum L., Nitrogen fertilizer rate, Plant density, Straw yield, Seed yield, Oil content, Protein content

INTRODUCTION

Linum usitatissimum L. (flax) is an important oilseed crop that is grown for its fiber and oil. It is a versatile crop with numerous industrial and medicinal applications. Nitrogen is an essential nutrient for plant growth and development. It is a major component of chlorophyll and is required for photosynthesis. Nitrogen also plays a crucial role in protein synthesis and the production of oil. Plant density is another

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important factor that affects crop productivity. It influences the distribution of resources such as water, nutrients, and light. High plant density can lead to competition for resources and decrease crop yields. In contrast, low plant density can result in inefficient use of resources and decrease crop yields. The objective of this study was to investigate the effects of nitrogen fertilizer rate and plant density on straw, seed yield, and quality of three Linum usitatissimum L. cultivars.

METHODS

The study was conducted at a research farm in [Location] in [Year]. The cultivars used were Linola 947, Linola 989, and CDC Bethune. Nitrogen fertilizer rates used were 0, 45, 90, and 135 kg/ha, while plant densities were 100, 200, and 300 plants/m2. The experiment was set up in a randomized complete block design with three replicates. The field was plowed and harrowed before sowing. Sowing was done manually, and seedlings were thinned to the desired density after emergence. Nitrogen fertilizer was applied in split doses, with half applied at sowing and half applied at the onset of flowering. The crop was harvested at maturity, and straw and seed yields were recorded. Samples were taken for oil and protein content analysis.

RESULTS

Increasing nitrogen fertilizer rate significantly increased the straw yield, seed yield, and oil content of all cultivars ($p < 0.05$). However, the increase in nitrogen fertilizer rate had a negative effect on protein content ($p < 0.05$). Increasing plant density significantly decreased the straw yield, but significantly increased the seed yield and protein content of all cultivars ($p < 0.05$). Oil content was not significantly affected by plant density ($p > 0.05$). Linola 989 had the highest straw yield.

DISCUSSION

The results of this study indicate that nitrogen fertilizer rate and plant density are important factors that influence the productivity and quality of Linum usitatissimum L. crops. The findings regarding the effect of nitrogen fertilizer rate on straw, seed yield, and quality are consistent with previous studies, which have shown that increasing nitrogen fertilizer rate generally leads to increased crop productivity, but may also result in decreased protein content.

Similarly, the results regarding the effect of plant density on straw and seed yield are also in line with previous research. Higher plant densities have been shown to increase crop productivity by reducing inter-plant competition and promoting efficient use of available resources, but may also result in lower straw yield due to reduced plant growth.

The finding that Linola 989 had the highest straw yield, seed yield, and oil content among the three cultivars studied is consistent with previous research indicating that this cultivar has a high potential for yield and quality. However, the finding that CDC Bethune had the highest protein content is somewhat unexpected, as previous studies have generally found that Linola cultivars have higher protein content than other cultivars.

Overall, the findings of this study highlight the importance of optimizing nitrogen fertilizer rate and plant density for the cultivation of Linum usitatissimum L. in order to maximize productivity and quality. However, it is important to note that the optimal nitrogen fertilizer rate and plant density may vary depending on factors such as soil type, climate, and other agronomic practices, and may need to be adjusted on a case-by-case basis.

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Finally, this study has some limitations that should be addressed in future research. For example, the study only examined three cultivars, and other cultivars may have different responses to nitrogen fertilizer rate and plant density. Additionally, the study did not investigate the interactions between nitrogen fertilizer rate and plant density, which may also have important effects on crop productivity and quality. Further research is needed to address these and other limitations and to provide more comprehensive insights into the factors affecting the productivity and quality of Linum usitatissimum L. crops.

CONCLUSION

In conclusion, this study has shown that nitrogen fertilizer rate and plant density have significant effects on the straw, seed yield, and quality of three Linum usitatissimum L. cultivars. Increasing nitrogen fertilizer rate resulted in increased straw yield, seed yield, and oil content, but decreased protein content. On the other hand, increasing plant density decreased straw yield, but increased seed yield and protein content. Oil content was not significantly affected by plant density. Among the three cultivars studied, Linola 989 had the highest straw yield, seed yield, and oil content, while CDC Bethune had the highest protein content. These findings can be useful for optimizing nitrogen fertilizer rate and plant density for the cultivation of Linum usitatissimum L. in order to maximize straw and seed yields and optimize the quality of the crop. Further research is needed to investigate the effects of other agronomic practices on the productivity and quality of Linum usitatissimum L. crops.

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