RESPONSE OF CARAWAY YIELD TO PLANT DISTANCE AND NITROGEN FERTILIZATION TREATMENTS IN RELATION TO EFFICIENCY OF EXPERIMENTAL DESIGNS

By

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B.Sc. Agric. Sci. (Ornamental Horticulture), Fac. Agric., Cairo Univ., 2005

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ABSTRACT

Two field experiments were carried out at the Agricultural Experiment Station of Faculty of Agriculture, Cairo University, during 2006-2007 and 2007-2008 seasons to study the effect of plant distance, nitrogen fertilization and to determine the optimum plot size, number of replications and number of sampling units on the yield of caraway (*Carum carvi* L.). The experimental design used was split-plot design with three replications. Plant distance treatments were 20, 40 and 60 cm, and they assigned in the main plots. Nitrogen fertilization treatments were 0, 10, 20, 30, 40 and 45 units N/feddan and they assigned at the sub-plots. Results indicated that the maximum values for plant height trait were obtained when planting was 20 cm between plants, while in number of branches/plant, number of umbels/plant, fruit weight/plant (gm), fruit yield/plot (gm), fruit yield/feddan (kg), 1000 seeds weight (gm), oil% and oil yield/feddan (L) traits the maximum values were obtained when the distance was 60 cm between plants. Also, the results indicated that maximum values for plant height, number of branches/plant, number of umbels/plant, fruit weight/plant (gm), fruit yield/plot (gm), fruit yield/feddan (kg), 1000 seeds weight (gm), oil% and oil yield/feddan (L) traits were obtained with applying 40 units nitrogen/feddan. Interaction between plant distance and nitrogen fertilization resulted in the maximum values of fruit yield/feddan (kg) with planting distance of 40 cm between plants and applying 40 units nitrogen/feddan. To determine the optimum plot size, number of replications and number of sampling units, data were subjected by two procedures, the first method was developed by Smith (1938) and the second method was the maximum curvature developed by Lessman and Atkins (1963). The results indicated that increasing plot size decreased the variance per basic unit, the index of soil variability ranged from 0.602 to 0.859. The optimum plot size was in smith's method 3.8 m^2 and in maximum curvature method was 3.3 m^2. The standard error for the yield character decreased as number of sample units increased. The optimum number of replications was 4-6 replications and the number of samples was 8-12 samples. The required number of sample units to achieve the same level of precision with number of replications indicated increasing precision. But when the amount of land is not available, it is better to increase the number of sample units.

Key words: caraway, *Carum carvi* L., plant distance, nitrogen fertilizer, optimum plot size, optimum number replication.

DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake.

It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

Also to my lovely sister and my brothers for all support they offered for me.

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RECOMMENDATION

- It may be recommended that planting at 60 cm between plants combined with applying 30 unit nitrogen/feddan can be used to get the highest yield of caraway fruits and essential oils.
- The optimum plot size for caraway plant was 4.5 m^2.
- Number of samples when used 4-6 replications were 6-8 plants.

استمارة معلومات الرسائل التى تمت مناقشتها

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5- مستخلص الرسالة (Abstract)

5-1 باللغة العربية : بشرط ألا يزيد عن 7 أسطر

(**الكلمات الدالة:** : الكراوية، مسافات الزراعة، التسميد النيتروجيني، أنسب مساحه للقطعة التجريبية، أنسب عدد مكررات)

اقيمت تجربتان حقليتان فى مزرعه كلية الزراعة- جامعة القاهرة خلال موسمي الزراعة 2006-2007 و 2007-2008 بهدف دراسة اثر مسافات الزراعة و التسميد النيتروجيني علي نبات الكراوية وكذلك تقدير انسب مساحه للقطعة التجريبية وعدد المكررات وعلاقة ذلك بعدد العينات المتحصل عليها من القطعة التجريبية، أهم النتائج لأعلي محصول البذور للفدان عند استخدام 40 سم بين النباتات واضافة 40 وحده نيتروجين للفدان، انخفضت قيمة الخطأ لجميع الصفات المدروسة بزياده العينات و المكررات، انسب عدد من المكررات كان من 4-6 وانسب عدد من العينات كان 8-12 عينة. ولوحظ ان زيادة المكررات كانت اكفأ من زياده العينات.

2-5 باللغة الأجنبية : بشرط ألا يزيد عن 7 أسطر

(Key Words: caraway, *Carum carvi* L., plant distance, nitrogen fertilizer, optimum plot size, optimum number replication**)**

Two field experiments were carried out at the Agricultural Experiment Station of Faculty of Agriculture, Cairo University, during 2006-2007 and 2007-2008 seasons to study the effect of plant distance, nitrogen fertilization and to determine the optimum plot size, number of replications and number of sampling units on the yield of caraway (*Carum carvi* L.). The results indicated that maximum values of fruit yield/feddan (kg) with planting distance of 40 cm between plants and applying 40 units nitrogen/feddan**,** The standard error for the yield character decreased as number of sample units increased. The optimum number of replications was 4-6 replications and the number of samples was 8-12 samples.