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RAPE YIELD AS AFFECTED BY MN-APPLICATION METHODS IN SANDY SOIL

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Abstract

Two field experiments were carried out at the farm of Ismailia Agricultural Research Station during 1990 and 1991 seasons to study the effect of Mn application methods on the yield as well as oil percentage and total oil yield of rape seed in sandy soil.

Results showed that seed coating treatment significantly increased seed yield by 76.09% and total oil yield by 99.44 %, respectively over those obtained from the control. Mn-application by soaking at pH 4 increased seed yield compared with those at pH values 6 and 8.

Spraying Mn at different pH values, resulted in a gradual increase in crop yield. The highest yield was obtained at Ph 8. Application of 0.30 g Mn in the form of EDTA/kg seed by the pH coating method is considered to be satisfactory for rape seed planted in sandy soils.

INTRODUCTION

Research on rape seed during the last 10 years has shown that this crop could be one of the important sources of edible oil. This crop is sometimes grown in alka-

line soils where Mn is not present in an available form. Mn deficiency has been found on certain saline and alkaline soils where good responses have been obtained from manganese application. Mangonese deficiency can be threfore corrected by the addition of Mn (e. g. $MnSO_4$) to the soil or by spraying. The seeds could also be coated with a thin layer of chelated Mn before sowing (Roy *et al.* 1981).

Application of trace elements in the forms of solid, foliar compounds and seed tratment by soaking as well as coating had induced significant increase on rape yield. Roy *et al* . (1981) reported that foliar application of micronutrients is not suitable for a good soil fertility programme.

Manganese application has als incresed the seed yield (Kroetz *et al* . 1977) and protein content of soybean (Boswell and Worthigton, 1971).

The present investigation examines the effect of manganese through coating, soaking and spraying methods on yield characters of rape seed grown in sandy soil.

MATERIALS AND METHODS

Two field experiments were conducted in the winter season of 1989-1990 and 1990-1991, at Ismailia Agricultural Research Station to study the response of rape plants (Var. N. A. 145) to manganese application using coating, soaking and spraying methods.

Soil samples were analysed for their content of avalible nutrients according to Jackson (1958) and Lindsay and Norvell (1969). The soil of that farm is sandy, the levels of available N, P and K as ppm were 20.0, 5.5, and 280.0 in a respective order. Nitrogen was estimated by the microkjeldahl method according to Jackson (1958). Phosphorus was determined colorimeterically according to Jackson (1958).

Potassium was estimated by the flame photomter according to Jackson (1958). The levels of availabvle Zn, Mn and Fe as determined by DTPA-extraction (Lindsay and Norvell 1969) were 0.8 ppm Zn, 4.0 ppm Mn, and 6.0 ppm Fe by atomic absorption spectrophotometer. The pH of the soil water suspension was 7.9 at 1:2.5 and the E. C. was 1.5 mmhos/cm.

Manganese was applied in the form of Mn EDTA throughout the different methods used during the two successive seasons. Coating rates were 0.15 and 0.30 g Mn/ one Kilogram seeds. Soaking and foliar treatments were prepared using 0.2g Mn-EDTA/L. at the pH values 4, 6 and 8. Rape seeds were soaked for 4 hours before sowing . Foliar application was undertaken twice after 30 and 45 days from sowing using 400 litres / feddan. Trition B material was used as a spreader in all treatments.

Randomized complete block design with four replicates was carried out. Each plot was 1/200/feddan. Rape seeds were planted in ridges 60 cm apart and 20 cm distance.

Phosphate fertilizer was applied at the rate of 30 kg P_2O_5/feddan before planting, whereas the nitogenous and potasium fertilizers at the rate of 45 kg N and 24 kg K_2O/ feddan, respectively were divided into tow equal doses and added after 20 and 35 days from sowing, respectively.

At harvest time, ten plants were taken at random for yield characters determinations i. e. seed yield as g / plant and seed yield as kg/ feddan. Oil percentage was determined according to A.O.A.C. (1975), throughout the two successive seasons, and data were statistically analysed.

RESULTS AND DISCUSSION

The effect of manganese application with different methods (coating, soaking and spraying) on the seed rape yield as g/plant or kg/ feddan, throughout the two successive seasons is shown in Table 1. Rape yield was significantly increased over the control by the coating treatment. Percentage increases amounted to 76.09% and 63.67% over the control for the plant yield as well as yield/ feddan, respectively during the first season. Corresponding values were 86.35% and 87.98% during the second season. Amberger (1974) reported that Mn is being the enzyme activating metal in the operation of nitrate reductase.

Mn application by seed soaking at pH 4 significantly increasd rape seed, but at

Table 1. Effect of Mn application on rape as g/plant and kg/ feddan during 1990 and 1991 seasons.

Manganese treatment	First season (1990)		Second season (1991)	
	Seed yield		Seed yield	
	g / plant	kg/f	g / plant	kg/ f
Control	9.37	278.00	9.30	306.99
Coating treatments:				
0.15 g Mn/kg seed	16.20 *	445.00 *	17.35 *	572.63 *
0.15 g Mn/kg seed	16.50 *	455.00 *	17.48 *	577.08 *
Soaking treatment:				
0.2 g Mn chelate /L pH 4	15.20 *	395.50 *	16.43 *	542.19 *
0.2 g Mn chelate /L pH 6	14.40 *	387.50 *	14.53 *	479.40 *
0.2 g Mn chelate /L pH 8	12.20 *	381.00 *	12.24 *	403.92 *
Spraying treatment:				
0.2 g Mn chelate /L pH 4	8.90	247.50	9.34	308.30
0.2 g Mn chelate /L pH 6	9.90	260.00	10.06	331.89
0.2 g Mn chelate /L pH 8	11.10	324.00	10.93	360.77
L.S.D. 5%	2.30	60.18	2.81	92.56

higher pH values the seed yield gradually decreased.

On the other hand, spraying the plants with chelated compound at different pH levels gave a slight increase in yield with increasing pH value. However, the differences were significant. Such results might be due to the function of manganese which regulates the oxidation-reduction system of iron.

In comparison, foliar application should be applied only when deficiencies are detected. Delaying of foliar application causes reduction in yield, particularly in annual crops. As the rate of application is much lower with foliar treatments, repeated spray might be necessary. This increases the costs of foliar application (Roy *et al.*, 1981). The same authors also pointed out that small amount of Mn applied in the immediate vicinity of th seed is effective in correcting the deficiency.

Therefore, it could be concluded that by using 0.15-0.30g Mn in a chelating

form/kg seeds by the coating method is satisfactory for rape seed production in sandy soils.

Oil percentage in rape seeds:

As shown in Table 2 oil percentage in rape seed grown in sandy soil was greater in the control than in most treatments, however, the differences were not significant. This might be due to the dilution effect of Mn treatments on rape yield production (Table 1).

Total oil rape yield:

Data presented in Table 2 indicate that the total oil rape yield as kg/feddan

Table 2. Effect of manganese application by different mehtods on oil yield content of rape seeds grown in sandy soils during 1990 and 1991 seasons.

Manganes treatment	First season 1990		Second season 1991	
	Oil concent. %	Oil Yield Kg /f	Oil concent. %	Oil Yield Kg / f
Control	37.34	103.81	35.51	109.01
Coating treatment:				
0.15 g Mn/kg seed	34.97	151.79 *	35.18	201.45 *
0.30 g Mn/kg seed	33.62	152.97 *	34.96	201.17 *
Soaking treatment:				
0.2 g Mn chelate /L. pH (4)	35.33	139.73 *	34.71	188.19 *
0.2 g Mn chelate /L. pH (6)	36.42	141.13 *	35.14	168.46 *
0.2 g Mn chelate /L. pH (8)	36.42	138.76 *	35.79	144.56 *
Spraying treatment:				
0.2 g Mn chelate /L. pH (4)	37.56	92.96	36.18	111.54
0.2 g Mn chelate /L. pH (6)	32.74	85.12	34.42	114.24
0.2 g Mn chelate /L. pH (8)	34.11	110.52	33.14	119.56
L.S.D. 5%	N.S.	33.19	N.S.	31.18

increased significantly with Mn tretments by the seed treatments (Coating and sooking). Manganese spraying method gave a slight insignificant increase in total oil yield. This might be due to the delay of foliar application.

The highest oil rape yield as kg/ feddan was obtained from the treatment which had received Mn by the coating method.

High total oil rape yield was also obtained by the soaking treatment, in case of pH4 and 6 then decreased with increasing the pH values.

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تأثير إضافة المنجنيز بطرق مختلفة على محصول الشلجم بالأراضى الرملية

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أقيمت تجربتان فى مزرعة محطة البحوث الزراعية بالإسماعيليه ممثله للأراضى الرملية خلال عامى ١٩٩٠ ، ١٩٩١ لدراسة تأثير عنصر المنجنيز بطرق مختلفة على الشلجم وكذلك نسبة الزيت فى الحبوب وكمية الزيت الناتجة.

أظهرت النتائج المتحصل عليها أن معاملة تغليف التقاوى بعنصر المنجنيز قد رفعت محصول البذور الناتجة بنسبة ٩٠ر٧٦٪ ، والمادة الجافة للنبات بنسبة ١٤٨٪ والزيت الكلى بنسبة ٤٤ر٩٩٪ فوق المقارنة.

إزداد معنويا محصول البذور الناتجة بمعاملة نقع البذور فى محلول عنصر المنجنيز بدرجة حموضه ٤ عن المقارنه ، ثم انخفض تدريجيا بزيادة درجة حموضة محلول النقع من ٦ الى ٨.

إزداد تدريجياً محصول بذور الشلجم برش المنجنيز المخلبى (٣ر. جم / لتر) بزيادة درجة حموضة محلول الرش من ٤ الى ٦ الى ٨ .

اضافة ٣ر. جم منجنيز على صورة (ايثيلين داى أمين تترا استيك اسد) لكل كيلو جرام بذور بطريقة التغليف يعتبر متميزاً لمحصول الشلجم بالأراضى الرملية.