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Effect of some planting systems on coriander-crop productivity

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ABSTRACT

The aim of the present research is to study the effect of some planting systems on coriander-crop yield. The main results of the study can be summarized in the following points:

** Grain-emergence percentage of coriander using seed drill was higher than using manual broadcasting, portable broadcasting-device, and mechanical broadcasting machine. The optimum grain emergence range of 92.6 to 97.2 % was obtained by using seed drill and the minimum value (88 %) was obtained by using manual broadcasting.*

** The highest grain yield (1263 kg/fed) was obtained by using grain drill and the lowest yield (950 kg/fed) was obtained by using manual broadcasting.*

** The highest criterion value "CVPE" (1398 LE/fed) was obtained with seed drill and the lowest (751.8 LE/fed) was obtained with manual broadcasting, indicating the economical advantage of using seed drill.*

1- INTRODUCTION

Coriander is an aromatic crop that contains 75% linalol aromatic-oil (Reda et al., 1998).

The increase of coriander area in Egypt, by using mechanical planting is very important to increase its production.

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The cultivated area of coriander increased from 6.11 to 14.21 thousand feddans between 1981 and 1998 (increase was more than 200 %), and there are plans to increase the area to 16.8 thousand feddans in 2012 (Reda et al., 1998).

The total production of coriander in Egypt increased from to 7.7 to 15.2 Gg (thousand ton) during the period from 1990 to 2002 (Agricultural Economic Statistics, 2003).

Mechanical grain sowing is very important in saving hand labor, improving production. A study by Abou-Sabe (1956) showed that the correct placement of seed gave an increase of 10 % in crop yield. Sharma et al. (1983) stated that the use of seed drill gives an Increase of 12.5 % in wheat yield and reduced the time required for sowing by 40 %. Besides, uniform placement of seed saved about 50 % of its quantity.

Yehia (1993 and 1997) and Awady et al. (1997, 1998a and 1998b) mentioned that the visible seed-damage increased and germination percent decreased by increasing feeder speed. That is due to increasing the momentum changes. The impact force increased by acceleration resulting in visible seed-damage.

Abdou (1995) investigated different methods of planting to recommend the most profitable system. He concluded that using a seed drill gave the highest sound seedling compared with row planter.

Yehia (2002) found that sunflower seed emergence percentage decreased by increasing forward speeds from 2.2 to 6.4 km/h for all mechanical planting methods. The maximum range of seed emergence of 96.06 to 98.40 % was obtained with mouldboard plough followed by disc harrow using pneumatic planter and the minimum seed

emergence of 68.12 % was obtained by using chisel plough two passes followed by disc harrow and manual planting.

El Sahrigi et al. (2001) concluded the highest grain productivity (1.5-1.950 Mg/fed) was obtained by using straight band sowing by grain drill with straight distributors and LASER land-leveling and the lowest yield (0.966 Mg/fed) was obtained by using manual broadcasting and traditional land leveling.

The objective of the present paper is to study the effect of some planting systems on corainder-crop yield and costs.

2- MATERIALS AND METHODS

The experiments were carried out during 2003 season in clayey loam soil at El-Gemmiza Research Station, El-Garbiea Governorate to evaluate some sowing methods, for optimum coriander yield.

. The mechanical analysis data of the experimental soil are summarized in table 1, according to Gemmiza Soil Laboratory.

Table 1: Physical properties of the experimental soil.

Fine sand, %	Coarse sand, %	Silt, %	Clay, %	Clay ratio	Soil texture
21.50	1.30	31.20	46.00	00.46	Clay-silt loam

Seed-bed preparation and land leveling implements:

Chisel plow was used in two passes with depth of 15-20 cm followed by disc harrow with depth of 15 cm and tractor with power of 80 hp (60 kW). A hydraulic leveling scraper was used with different grain-sowing methods.

A mounted chisel plow (El-Behira Co.) consisted of seven shanks arranged in two rows.

A disc harrow consisted of 4 gangs with 28 discs, each 50 cm diameter.

A hydraulic leveling scraper (El-Behira Co.) with a width blade of 180 cm was used.

Sowing machines:

* *Mounted seed-drill (Sulky type)* 21 row was used with rows spacing of 12 cm, along with other machines:

* Mounted broadcasting machine.

* Portable broadcasting machine operated manually.

Tractors:

Massy Ferguson tractor of 40 hp (30 kW) was used with all sowing implements, and Allis-Challmars tractor of 80 hp (60 kW) was used in seed-bed preparation.

Sowing methods:

Four sowing methods were investigated (manual broadcasting, broadcasting by tractor mounted machine, broadcasting by portable machine, and drilling by seed drill.

Forward speeds:

Four forward speed (2.2, 4.28, 4.89 and 6.4 km/h) were investigated for mounted brodcasting machine and seed drill.

Seed rate and row spacing:

Seed rate was 5 kg/fed with row spacing of 30 cm for drilling by seed drill and 6 kg for broadcasting machines, and 7 kg for manual broadcasting.

The yield estimation:

The grain yields were evaluated by taking 4 samples (1 m^2 area) randomly selected from each plot. The plants were harvested and threshed manually and then measured.

Estimating costs of using the machines:

Cost of operation was calculated according to the equation given by Awady.(1978), in the following form:

$$C = p/h\ (1/a + i + t/2 + r) + (1.2\ w.s.f) + m/144,$$

Where: C = hourly cost (LE), p = price of machine (LE), h = yearly working hours, a = life expectancy of the machine, i = interest rate/year, t = taxes, r = overheads and indirect cost ratio , w = power of the machine kW, s = specific fuel consumption l/kW.h, f = fuel price L.E./l, and m= monthly wage rate. "1.2" is a factor (upper limit) to take lubrication and greasing into account. "144" is estimated monthly working hours. Notice that all units have to be consistent to result in L.E/h.

Criterion function:

A comparative criterion function as devised by Awady et al. (2000) was used to indicate economic advantage when using the manual broadcasting, portable broadcasting device, broadcasting machine operated by tractor and seed drill.

The criterion (at different forward-speeds and planting-methods) value takes into account the value of resulting crop yield minus planting expenses, with all other economical conditions kept constant for comparison. Meanwhile, planting expenses include: planting cost + seed losses. It is suggested to call this value "Crop Value minus Planter Expenses, CVPE".

CVPE = Crop value – Planting expenses .

= Crop value – (planting cost + seed loss cost)

Crop Value (LE/fed) = crop prod. (Mg/fed) * crop sale value (LE/Mg).

4- RESULTS AND DISCUSSION

Effect of sowing method on coriander seed-emergence.

Fig. 1 shows grain emergence of coriander at different forward-speeds and planting-methods.

Seed emergence percentage decreased by increasing forward speeds from 2.2 to 6.4 km/h at all mechanical planting methods. The maximum range of seed emergence of 92.6 to 97.2 % was obtained by grain drill and the minimum value of 88 % was obtained by manual broadcasting. This may be due to grain distribution which gave a suitable plant area and lights transfer.

Effect of sowing method on coriander seed yield.

Fig. 1 shows the seed yield of coriander crop at different forward speeds and sowing methods.

Data show that the highest grain yield (1176 - 1263 kg/fed) was obtained by using seed drill and the lowest yield (950 kg/fed) was obtained by using manual broadcasting. This may be due to grain distribution which gave a suitable plant area and light transfer.

Estimating costs of using the machines.

The operating costs of different planting methods are shown in table 2.

The minimum operating cost of 2.14 LE/Mg was obtained with broadcasting device operated manually. Meanwhile, the maximum operating cost of 13.04 LE/Mg was obtained with broadcasting.

The highest criterion value of "CVPE" (7180 LE/fed) was obtained with seed drill and the lowest value (5679 LE/fed) was obtained with manual broadcasting, indicating the economical advantage of the first planting method.

It is observed from table 2 that differences in operation expanses and losses are marginal when compared with crop values. However, noticable differences in crop values result from different sowing methods.

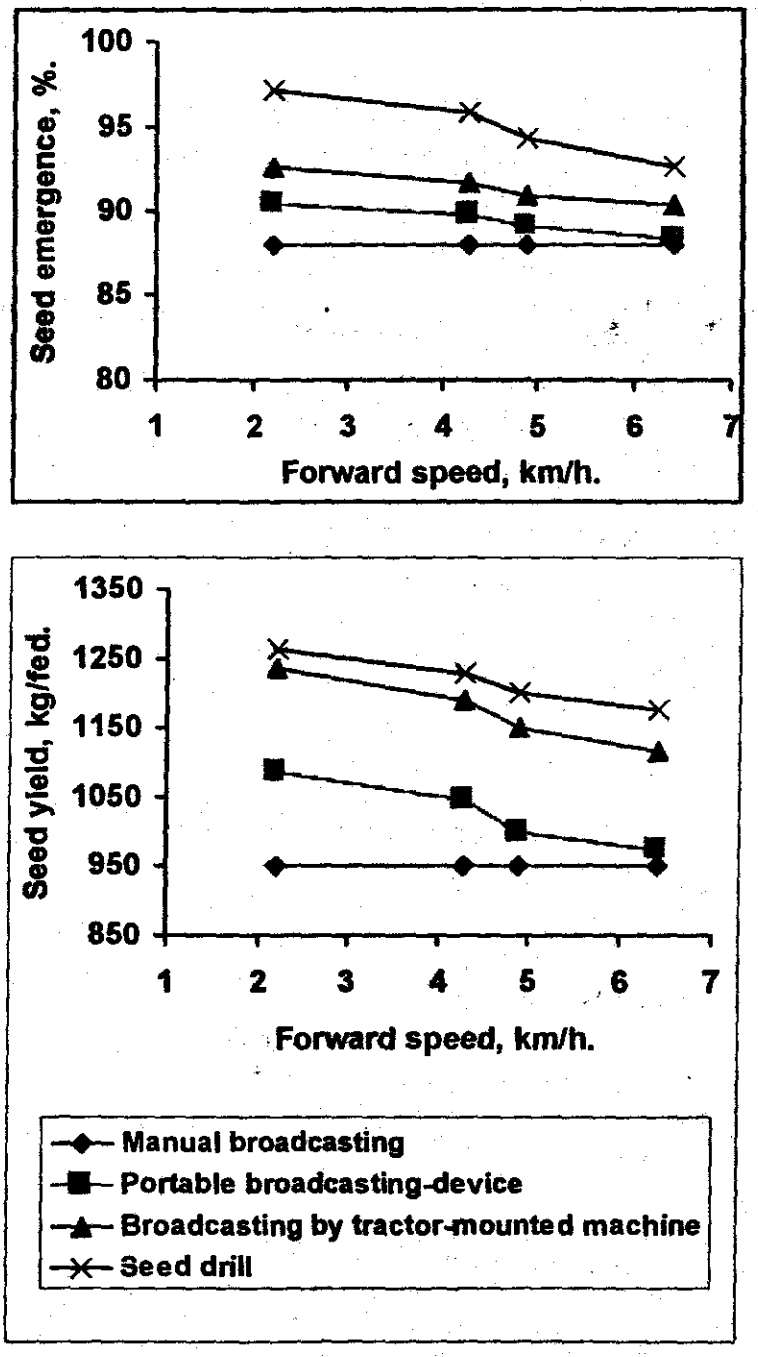

Fig. 1: Seed emergence and yield of coriander.

Table 2: The operating costs and CVPE (Crop Value minus Planter Expenses) for different planting methods.

Planting method	Operating cost,		CVPE, LE*
	LE/fed	LE/Mg	
Manual broadcasting	5	5.26	5679
Portable broadcasting device	2.14	2.14	6290
Broadcasting machine	15	13.04	6877
Drilling by seed drill	12	10	7180

* One American dollar = 6.1 Egyptian pound (LE), according to prices of 2003.

Conclusion

Coriander sowing by seed drill and a suitable forward speed of 4.89 km/h gave the highest yield of 1.2 Mg/fed and highest criterion cost of 7180 L.E./fed as comparing with manual broadcasting, broadcasting by a portable device, broadcasting by machine, and drilling by seed drill.

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الملخص العربى

تأثير بعض أنظمة الزراعة على إنتاج محصول الكزبرة

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تهدف هذه الدراسة إلى تحديد تأثير بعض أنظمة الزراعة على إنتاج محصول الكزبرة لأختيار الحزم الآلية لزيادة أنتاجية هذا المحصول. وكانت أنظمة الزراعة المستخدمة هى: النثر اليدوى، النثر بواسطة جهاز يدار يدويا يعلق على صدر العامل، آلة نثر معلقة على الجرار، آلة تسطير. كما تم أستخدام ثلاث سرعات للآلات وهى ٢,٢، ٤,٢٨، ٤,٨٩، ٦,٤ كم/ساعة. وأجريت التجارب فى محطة بحوث الجميزة خلال موسم ٢٠٠٣. و تم الحصول على النتائج التالية:

١- **نسبة الإنبات:** وجد أن نسبة الإنبات عند استخدام آلة التسطير أعلى منها فى حالة استخدام النثر اليدوى، النثر بجهاز محمول على صدر العامل، والنثر بالآلة. وتراوحت أفضل نسبة إنبات بين ٩٢,٦ إلى ٩٧,٢ % باستخدام السطارة تبعا للأختلاف فى السرعة، وأقل نسبة إنبات ٨٨ % باستخدام النثر اليدوى.

٢- **الإنتاجية:** تم الحصول على أعلى إنتاجية حبوب كزبرة بين ١١٧٦ إلى ١٢٦٣ كج/فدان عند استخدام السطارة تبعا لأختلاف السرعة، كما تم الحصول على أقل إنتاجية (٩٥٠ كج/فدان) عند استخدام النثر اليدوى.

٣- **تكاليف التشغيل والتكاليف الحدية:** وجد أن أقل تكاليف تشغيل (٢,١٤ جنيه/فدان أو ٢,١٤ جنيه/ميجاجرام) عند استخدام النثر بآلة النثر المعلقة على صدر العامل، وأعلى تكاليف تشغيل (١٥ جنيه/فدان أو ١٣,٠٤ جنيه/ميجاجرام) عند استخدام النثر بواسطة الآلة. بينما كان أعلى قيمة للعامل المحدد للإنتاج ناقص التكاليف والفقد (CVPE)(٧١٨٠ جنيه/فدان) عند استخدام السطارة عند سرعة ٤,٨٩ كم/ساعة.

٤- يوصى بأستخدام السطارة عند سرعة ٤,٨٩ كم/ساعة لزراعة محصول الكزبرة والتى أعطت أعلى عائد.

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