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Study of some Factors Affecting a Mechanical Planting of Sesame coated-seeds

Yehia, I. [1]; A. E. Abu EL-Maaty [*2] and Y. A. Abd-Al Fattah[1]

[1]. Agricultural Engineering Research Institute, Dokki, Egypt.
[2]. Faculty of Agricultural Engineering, Al-Azhar University, Assiut Branch, Assiut, Egypt.

ABSTRACT

The aim of this research is to study the factors affecting a mechanical planting of sesame coated-seeds. The tested parameters of mechanical planting of sesame coated-seeds are metering-device speed ranged between 20 to 60 rpm and forward speed ranged between 1.82 to 4.79 km/h. The main results in this study can be Concluded that in the following points: The maximum sesame coated-seed discharge of 4.12 kg/fed was obtained with metering-device speed of 20 rpm. Meanwhile, the minimum sesame coated-seed discharge of 2.89 kg/fed was obtained with metering-device speed of 60 rpm The maximum sesame plant-emergence of 88.4 % was obtained with forward speed of 1.82 km/h. Meanwhile, the minimum sesame plant-emergence of 77.1 % was obtained with forward speed of 4.79 km/h. By increasing forward speed from 1.82 to 4.79 km/h the total sesame seed-yield decreased from 912 to 577 kg/fed. The operation and production costs at optimum forward speed of 2.97 km/h were 65.7 L.E/h and 96 L.E./fed.

***Keywords*:** planting mechanization, Planter forward speed, seed germination, seed damage, Longitudinal plants-distribution

INTRODUCTION

Sesame is an important oil crop that seeds are characterized by high oil and protein content, ranging from 46.6 – 52.4 % and 24 – 27.6 % respectively (Gadade et al., 2017). Also, sesame seeds have some mineral salts and vitamins. The cultivated area of sesame in Egypt reached about 66.3 thousand feddan in 2018 that produces about 347 thousand ton per year (Agricultural Statistics Economic Affair Sector, 2019).

Seeds vary greatly in size and shape. In many cases, seed size is small or irregular, making singularization and precision placement difficult. In addition, seeds should be protected from a range of pests that attack germination seeds or seedlings.

Seed-coating technologies can be employed for two purposes: they can facilitate mechanical sowing to achieve uniformity of plant spacing and can act as a carrier for plant protectants (Taylor et al., 1998).

Film coating is a method adapted from the pharmaceutical and confectionery industries for uniform application of materials to seeds. The film forming formulation consists of a mixture of polymer, plasticizer and colorants (Halmer, 1998 and Robani, 1994), and formulations are commercially available that are ready-to-use liquids or prepared as dry powders (Ni, 1997). Application of the film-forming mixture results in uniform deposition of material on each seed with little variation among seeds (Halmer, 1998). The formed film may act as a physical barrier, which has been reported to reduce leaching of inhibitors from seed coverings and may restrict oxygen diffusion to the embryo (Duan and Burris, 1997). Film coating is routinely performed in vented or perforated pans on a large-scale basis either on a batch or continuos system (Halmer, 1998 and Robani, 1994). Film coating is versatile as a coating system or a component of a coating system. Colorants as aesthetic appeal to seeds, serve to color-code different verities and increase the visibility of seeds after sowing. Film-coated seeds have better flow characteristics in the planter (Hill, 1997) due to reduced friction between seeds. Film coating provides an ideal method for the application of chemical and / or biological seed treatments (Taylor et al., 1994 and McGee, 1995).

El-Habbal et al. (1995) proved that coating sesame seeds with fertilizer containing Fe, Mn and Zn (2:1:2 by weight) at the rate of 6.5 g/kg seeds gave significant increments in number of spikes/plant, grain mass/plant and both grain and straw yields/fed. Doğan and Zeybek (2009) found that the pelleted sesame seeds had a mean yield value of 1976.3 kg ha^{-1}, whereas the non-pelleted sesame seeds had a mean yield value of 1243.2 kg ha^{-1} .

Doğan et al. (2005) tested the pneumatic planter using forward speed range of 0.5 – 2.0 ms^{-1} for planting coated sesame seeds. It was found that the optimum forward speed was 0.5 ms^{-1} which gave the best sesame-seed spacing of 0.5 – 1.5 cm.

Karayel (2011) found that by increasing forward speed from 1 to 2 m/s the mean soybean seeds spacing increased from 99 to 104 mm and precision spacing increased from 19.7 to 29.8 %, the miss index of soybean seeds increased from 8.2 to 25.9 %, the multiple index decreased from 15.7 to 6.9 % and the mean depth decreased from 51 to 43 mm and the coefficient of variation of depth to increase from 14.7 to 18.9 %. Barut (2008) studied the seed coating and tillage effects on sesame stand establishment and planter

[*] Corresponding author.
E-mail address: drashoureid@gmail.com
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performance for single seed sowing. The results showed that seed treatments had a significant effect on plant emergence date, percentage of emergence uniformity and planter performance in single seed sowing of sesame. The coating delayed seed germination, therefore, the naked sesame seeds had the most rapid emergence and the maximum percentage of emergence. The quality of feed index, multiple index and precision of the coated seeds were better in terms of quality of feed index, multiple index and precision depending on coating material.

The objective of this investigation is to study the effect of mechanical planting of sesame coated-seeds such as metering-device and forward speeds on seed damage and discharge, seed germination and emergence, Missing hills and double plants percentage, planter ground-wheel slip and sesame-seed yield .

MATERIALS AND METHODS

Materials:

Seed variety: Sesame seed variety of "Shandawell 3" was used in the experimental tests. Table 1 shows some physical properties of sesame coated-seeds. These data were measured on 100 seeds sample, according to the standards set in (Mohsenin, 1986).

The agronomic requirements of sesame crop are seeds rate of 1.6 - 1.7 and 3.8 – 4 kg/fed for uncoated and coated seeds respectively number of seed/fed of 84000 - 85000, row spacing of 50 cm, and distance between seeds of 10 cm. The germination percent of tested sesame (Shandawell 3) coated seeds was 88.73 %.

The tested coating machine: The coating machine used in this study was developed by Abd-Al Fattah *et al.* (2015). Isometric sketch of the coating machine are shown in fig. 1. The main coating machine parts are frame, coating pan, shaft, hot-air dryer, two hinged links and power unit.

Coating chemical-materials: The tested sesame seeds were coated with Fe, Zn elements and "Cersan.2 %" fungicide. Chemicals sesame-seeds ratio of 5g/kg was used (Abd-Al Fattah *et al.*, 2015). The coating layer needs 0.3: 1 wheat-flour powder seed ratio (Abd-Al Fattah et al., 2015). Arabic gum solution concentration of 75 % was used (according to Yehia, 2008). Seed batch of 2.5 kg, coating time of 15 min., coating temperature of 30 ^{0}C and coating speed of 28 rpm were used (according to Mohamed, 2017). Germination test was conducted by using 100 seeds which was planted in foam bins with 100 eyes, temperature range from 37.9 to 40 °C. The seed germinations were measured after 7 – 10 days at different tested parameters (Abd-Al Fattah *et al.*, 2015).

Table 1. Physical properties of sesame-seeds before and after coating at optimum parameters of batch mass of 2.5 kg, coating-unit speed of 28 rpm, coating temperature of 30 ^{0}C, coating time of 15 minutes and coating with "Fe + Zn + Cersan".

Properties	Before coating				After coating			
	Max.	Min.	Av.	C. V.	Max.	Min.	Av.	C. V.
The mass of 1000 kernel, g.	3.44	2.78	3.31	0.39	25.3	24.7	24.9	0.05
Real density, kg/ m³		418		-		438		-
Bulk density, kg/ m³		389		-		427		-
Dimensions:								
Length, mm.	4.18	3.88	3.98	0.17	4.71	4.47	4.54	0.11
Width, mm	3.53	3.31	3.41	0.16	3.93	3.47	3.73	0.19
Thickness, mm	2.54	2.27	2.39	0.33	2.63	2.44	2.53	0.17
Volume, mm^3	18.5	13.9	16.8	0.29	24.2	18.2	20.8	0.29
Projected area, mm^2	11.7	9.9	10.8	0.19	18.7	15.4	13.9	0.26

Max: maximum, Min.: minimum, Av.: average and C. V.: coefficient of variation.

Mechanical planter: The tested mechanical planter consists of the main frame with the tool bar and three hitching points and two planting units. Each planting unit consists of the following parts: seed box, seed cutoff, metering-device housing, a vertical roller metering device with 14 cells (cell diameter of and depth of 6 mm), transmission system which has transmission ratio between drive wheel (press wheel) and metering- device shaft of 1 : 0.7, frame, double-disc furrow opener and press wheel (covering device) with diameter of 470 mm. Fig. 2 shows the mechanical planter (Sabry, 2018).

Tractor: Kubota of 22.4 kW (30 hp) was used for operating the planter.

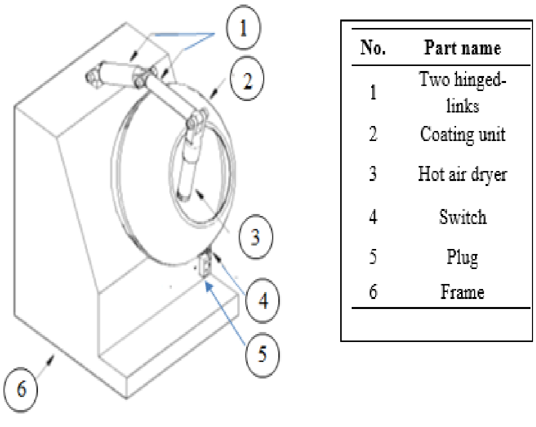

Fig. 1. Isometric sketch of the seed-coating machine (Abd-Al Fattah *et al.*, 2015).

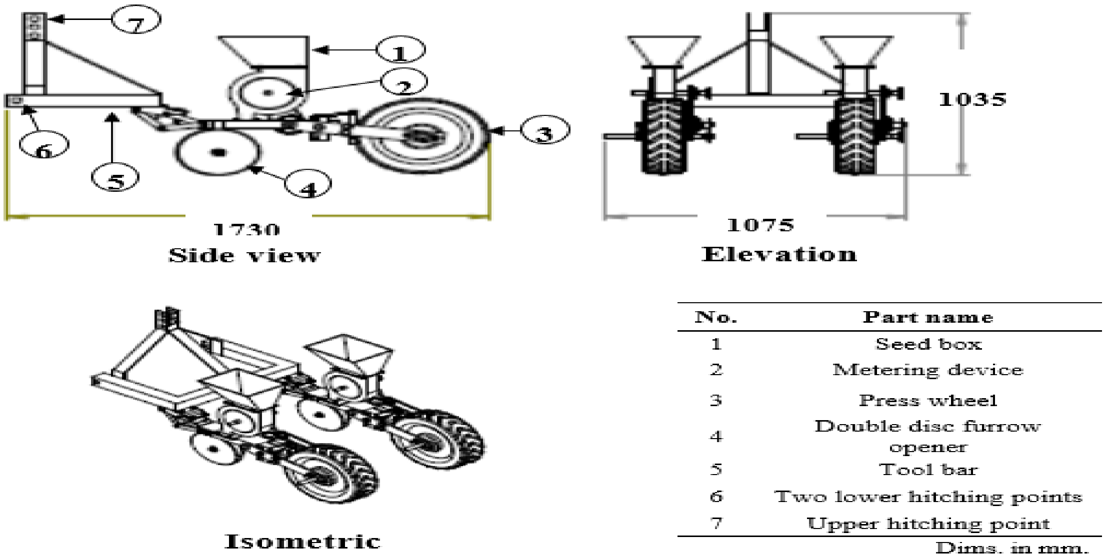

Fig. 2. Elevation, side view and isometric of the tested planter (Sabry, 2018).

Methods:

Laboratory tests: Primary tests were carried out to choose the studied-parameter ranges. Laboratory experiments were conducted to optimize the following parameters:

Metering-device speed: Five metering-device speeds of 20, 30, 40, 50 and 60 rpm (0.21, 0.31, 0.42, 0.52 and 0.63 m/s) were tested.

To optimize the laboratory parameters, the following indicators were taken into consideration.

Seeds discharge: The seed discharge was measured by rotating the press wheel. The fed seeds were collected in plastic bag during a certain number of feeding shaft revolutions and consequently seeds discharge was determined.

Seeds damage: For the previously mentioned factors, the damaged seeds including any significant bruising, skin removal or crushing were sorted manually and counted.

The damage of seeds after passing through the metering device was calculated by the following equations **(Yehia, 1993)**:

$$\text{Seeddamage,\%} = \frac{\text{No. of damaged seeds}}{\text{Total No. of seeds}} \times 100$$

Field experiments:

Field experiments were carried out at Shandawell Research Station, Agricultural Research Center, Sohag Governorate. Primary tests were carried out to choose the studied-parameter ranges. The mechanical analysis of the experimental soil was classified as a sandy soil. Four forward-speeds of 1.82, 2.97, 3.84 and 4.79 km/h (metering device speeds of 14, 24, 30 and 38 rpm and ground wheel speeds of 21, 34, 44 and 55 rpm) were tested.

To optimize the field parameters, the following indicators were taken into consideration.

Longitudinal plant-distribution: The longitudinal plant-distribution was analyzed to determine coefficient of variation (CV) of seeds spacing according to the following formula (Yehia, 1993):

$$\text{CV, \%} = \frac{\text{SDof}\,seeds\,\text{spacing}}{\text{Recommended}\,seeds\,\text{spacing}} \times 100$$

$$\text{SD} = \sqrt{\left(\sum (\text{Plantspacing} - \text{Recommended}\,seeds\,\text{spacing})^2\right)/n}$$

Where:

SD is the standard deviation.

n is number of seed spacing.

Recommended seed-spacing = 10 cm for sesame seeds.

Emergence percentage: The number of plants per meter of the row was counted for the four tested speeds (1.82, 2.97, 3.84 and 4.79 km/h) to determine emergence percentage according to the following formula:

$$\text{Emergence}\,percentage = \frac{\text{Germinated seeds}}{Total seeds} \times 100$$

Missing hills percentage or index: Missing-hills percentage or index indicates that the incapability of seed metering unit to drop even a single seed within the desired range of seed spacing. Missing percentage or index is the indicator of how often the seed skips at the desired spacing. It is the percentage of spacing greater than 1.5 times the theoretical spacing. The missing-hill percentage or index was calculated according to the following formula (Grewal, 2014):

$$\text{Missinghills} = \frac{\text{Numberofmissing}\,plants\,\text{inmeter}}{Total plants\,\text{inmeter}} \times 100$$

Double plants percent or multiple index: Multiple index includes two or more seeds picked and dropped by the seed metering device by a single cell in the metering wheel. The multiple index is an indicator of more than one seed dropped within a desired spacing. It is the percentage of spacing that are less than or equal to half of the theoretical spacing. The objective is to minimize the multiples to save costly seeds and to subsequently reduce the labor required for thinning the extra plant population (Grewal, 2014).

$$\text{Double plants} = \frac{n1}{N} \times 100$$

Where:

n1 = Number of spacing that are less than or equal to half of the theoretical spacing in the given observations and

N = Total number of observations

Slippage percent: Slip of ground (press) wheel were estimated for four forward-speeds. Slippage percentage was calculated by using the equation (Awady, 1992).

$$\text{Slippage,\%} = \frac{\text{Actualdistance} - \text{Theoreticaldistance}}{\text{Theoreticaldistance}} \times 100$$

$$\text{Theoreticaldistance} = \text{No.ofwheel revolutions} \times \pi \times \text{wheeldiam}.$$

Final yield: Two rows of sesame crop with 20 m length for each forward speed were harvested by manual tool and dried in open air (the drying time of 20 day) and threshed and weighed by analog balance and the yield was calculated.

Effective field-capacity: Four speeds were used during the field experiments. Times were recorded for the following operations: planting; turning; filling and adjusting to calculate field capacity.

Required power: Required power was calculated by using the following formula (Hunt, 1983):

$$P = 3.23\ Fc$$

Where:

P = Power requirements (kW) and Fc = The fuel consumption (L/h.).

Specific energy: Specific energy can be calculated by using the following equation:

$$\text{Specific energy (kW.h/fed.)} = \frac{\text{Requiredpower(kW)}}{\text{Actualfield capacity(fed./h)}}$$

Cost analysis: The operation cost of the mechanical planter was calculated according to equation of (Awady, 1978) in the following form:

$$C = \frac{P}{h}\left(\frac{1}{a} + \frac{i}{2} + t + r\right) + (1.2\text{w.s.f}) + \frac{m}{144}\text{,L.E/h}$$

Where:

C = Hourly cost, P = Price of machine, h = Yearly working hours, a = Life expectancy of the machine, i = Interest rate/year, t = Taxes, and over heads ratio, r = Repairs and maintenance ratio, w = Power of the machine, s = Specific fuel consumption, f = Fuel price, m = Monthly wage ratio, 1.2 = Factor accounting for ratio of rated power and lubrications and 144 = Estimated monthly working hours. Table 2 shows the constants used in Awady equation.

Table 2. The constants used in Awady equation.

	P, L.E.	h, h/year	a, year	i, %	t, %	r, %	w, kW	s, L/kW.h	f, L.E/L	m, L.E/month
Tractor	5250000	1500	10	16	5	6	22.4	0.05	3.6	1500
Planter	5000	500	10	16	5	6	-	-	-	-

L. E. is Egyptian pound.

RESULTS AND DISCUSSION

Results of laboratorial experiments:

Laboratory experiments were carried out to study the effect of metering-device speed on the performance of the metering-device for sesame coated-seeds. Laboratory experiments help to adjust the machine under the optimum conditions for the filed experiments.

Effect of metering-device speed on sesame coated-seed discharge.

Fig. 3 shows the effect of metering-device speed on sesame coated-seed discharge. Results show that seed discharge decreased by increasing metering-device speed for sesame coated-seeds.

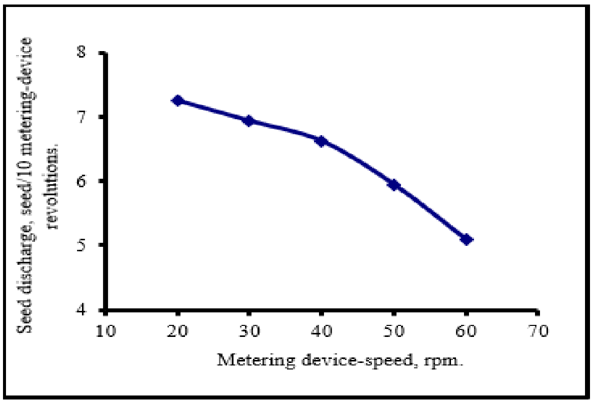

Fig. 3. Effect of metering-device speed on sesame coated-seeds disch|arge.

The maximum sesame coated-seed discharge of 7.25 g/10 revolution of metering device or 4.12 kg/fed was obtained with metering-device speed of 20 rpm. Meanwhile, the minimum sesame coated-seed discharge of 5.09 g/10 revolution of metering devic or 2.89 kg/fed was obtained with metering-device speed of 60 rpm

Data shows that by increasing metering-device speed from 20 to 60 rpm the sesame coated-seed discharge decreased by 29.8 %.

The decreasing of coated seed discharge by increasing metering device speed is due to the time is not enough to fill all cells of metering-device wheel.

Effect of metering-device speed on coated-seed damage.

Fig. 4 shows the effect of metering-device speed on sesame coated-seeds damage. Results show that seed damage increased by increasing metering-device speed.

The maximum sesame coated-seeds damage of 3.89 % was obtained with metering-device speed of 60 rpm. Meanwhile, the minimum sesame coated-seeds damage of 0.37 % was obtained with metering-device speed of 20 rpm.

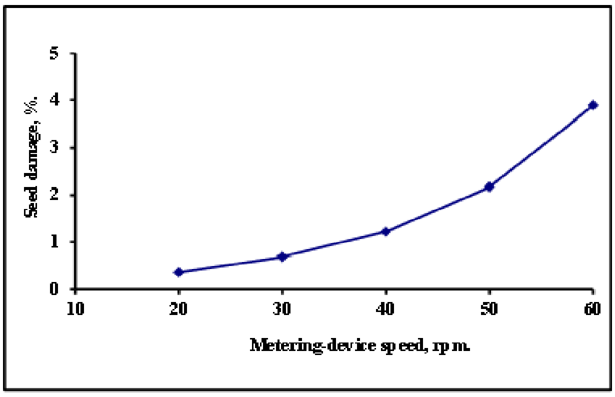

Fig. 4. Effect of metering-device speed on sesame coated-seed damage.

The increase in coated-seed damage by increasing metering device speed from 20 to 60 rpm is due to increasing momentum of seeds (momentum = mass x velocity) and increasing impact force accordingly.

Effect of metering-device speed on coated-seed germination.

Fig. 5 shows the effect of metering-device speed on sesame coated-seeds germination. Results show that coated-seed germination decreased by increasing metering-device speed.

The maximum sesame coated-seeds germination of 85.2 % was obtained with metering-device speed of 20 rpm. Meanwhile, the minimum sesame coated-seeds germination of 77.5 % was obtained with metering-device speed of 60 rpm Data shows that by increasing metering-device speed from 20 to 60 rpm the sesame coated-seeds germination decreased by 11.8 %.

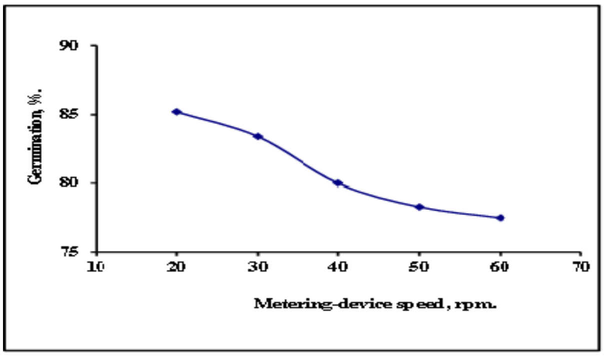

Fig. 5. Effect of metering-device speed on sesame coated-seed germination.

Results of field experiments:

Effect of forward speed on planter performance:

Plant emergence.

Fig. 6 shows the effect of forward speed on sesame plant-emergence. Results show that plant emergence decreased by increasing forward speed.

The maximum sesame plant-emergence of 88.4 % was obtained with forward speed of 1.82 km/h. Meanwhile, the minimum sesame plant-emergence of 77.1 % was obtained with forward speed of 4.79 km/h.

Data shows that by increasing forward speed from 1.82 to 4.79 km/h the sesame plant-emergence decreased by 12.8 %.

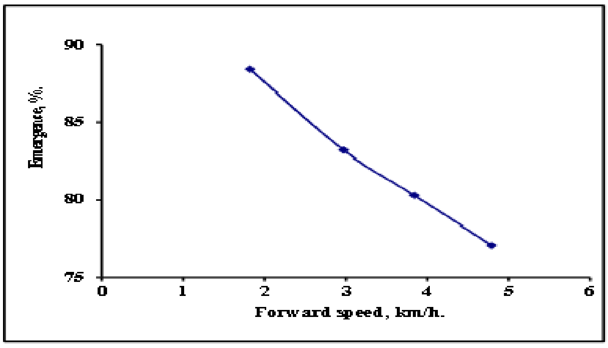

Fig. 6. Effect of forward speed on sesame plant-emergence.

Longitudinal plants-distribution and plant scattering.

The plants distribution was analyzed in order to determine the frequency, average and coefficient of variation (CV) of sesame plant-spacing. A low CV represents a row with more uniform seed spacing, and vice versa. Table 3 shows average and CV of sesame plant-spacing.

The optimum conditions clarify that the forward speed of 2.97 km/h had the best longitudinal seed distribution "average sesame plant-spacing of 10.1 cm, and CV of 6.2 %".

The increase of plant scattering by increasing forward speed may be due to increasing ground-wheel slip in addition to the increase of machine vibration.

Table 3. Effect of forward speed on average and CV of sesame plant-spacing.

Plant spacing	Forward speed, km/h.			
	1.82	2.97	3.84	4.79
Average, cm.	9.8	10.1	11.3	12.2
CV	4.1	6.2	7.3	7.8

Missing hills and double plants index.

Fig. 7 shows the effect of forward speed on missing hills and double sesame-plants. Missing hills increased with increasing forward speed. Double plants decreased with increasing forward speed.

Data shows that by increasing forward speed from 1.82 to 4.79 km/h the missing-hills percent or index increased from 1.25 to 4.5 %.

Data shows that by increasing forward speed from 1.82 to 4.79 km/h the duple-sesame-plant percent or index decreased from 21.7 to 1.25 %.

The increasing of missing hills and decreasing of double plants by increasing forward speed is due to increasing ground wheel slip.

Ground-wheel slip percent.

Fig. 8 shows the effect of forward speed on ground-wheel slip percent. The ground-wheel slip increased with increasing forward speed.

The maximum slip of 7.24 % was obtained with forward speed of 4.79 km/h. Meanwhile the minimum slip of 4.11 % was obtained with forward speed of 1.82 km/h.

Total sesame seed-yield.

Fig. 9 shows the effect of forward speed on total sesame seed-yield. The total seed-yield decreased with increasing forward speed.

Data shows that by increasing forward speed from 1.82 to 4.79 km/h the total sesame seed-yield decreased from 912 to 577 kg/fed.

The decrease in total crop-yield by increasing forward speed is due to the low plant emergence resulting from high ground-wheel speed (metering-device speed) and also due to decreasing of longitudinal plant distribution.

Effective field-capacity and efficiency.

Fig. 10 shows the effect of forward speed on effective field-capacity and field efficiency. The effective field-capacity increased and field efficiency decreased with increasing forward speed.

The maximum effective field-capacity of 1.02 fed/h was obtained with forward speed of 4.79 km/h. Meanwhile, the minimum effective field-capacity of 0.45 fed/h was obtained with forward speed of 1.82 km/h.

The maximum field-efficiency of 85.86 % was obtained with forward speed of 1.82 km/h. Meanwhile, the minimum field-efficiency of 74.51 % was obtained with forward speed of 4.79 km/h.

Decreasing field-efficiency by increasing forward speed is due to decreasing time losses.

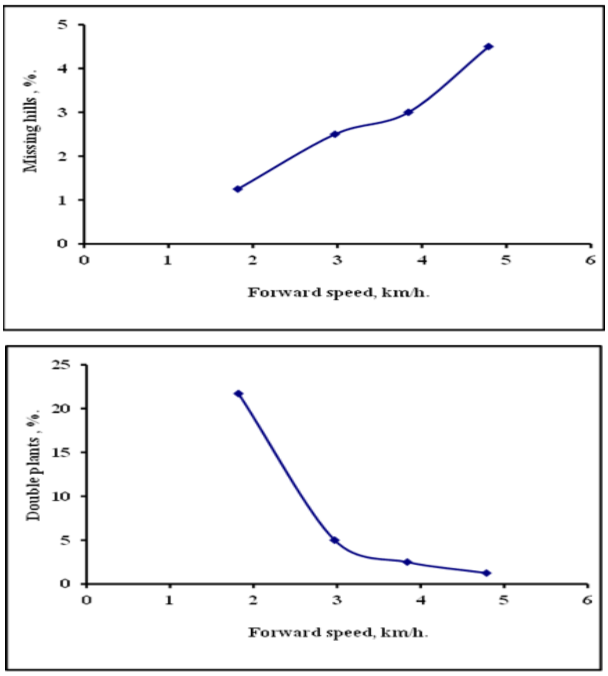

Fig. 7. Effect of forward speed on missing hills and double sesame-plants.

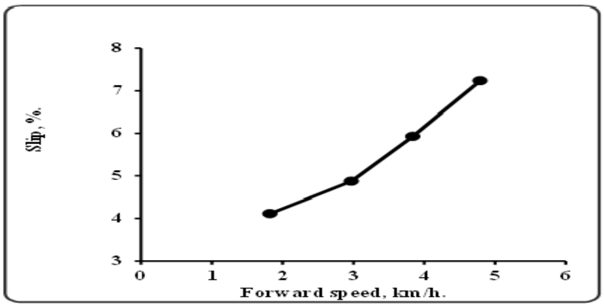

Fig. 8. Effect of forward speed on ground-wheel slip percent.

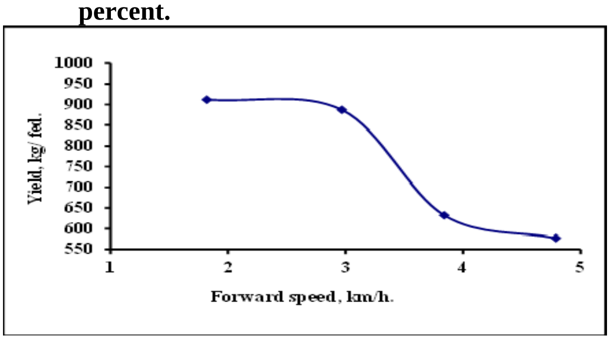

Fig. 9. Effect of forward speed on sesame seed-yield.

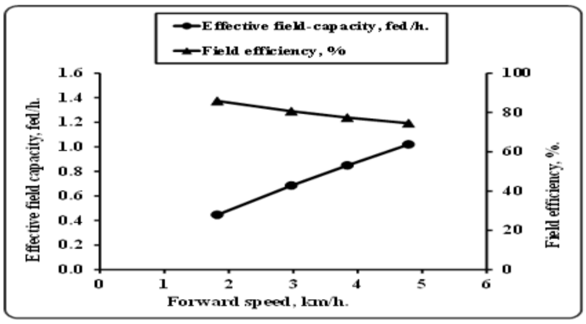

Fig. 10. Effect of forward speed on effective field-capacity and field efficiency.

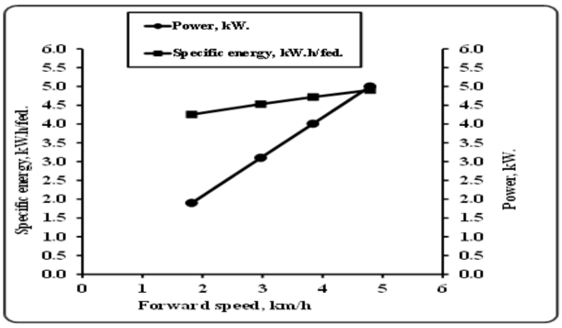

Fig. 11. Effect of forward speed on power and specific energy.

Required power and specific energy.

Fig. 11 shows the effect of forward speed on required power and specific energy. Required power and specific energy for operating the mechanical planter increased with increasing forward speed.

By increasing forward speed from 1.82 to 4.79 km/h required power increased from 1.90 to 5.00 kW and specific energy increased from 4.25 to 4.90 kW.h/fed.

The maximum required-power and specific energy of 5.0 kW and 4.90 kW.h/fed were obtained with forward speed of 4.79 km/h. Meanwhile the minimum required power and specific energy of 1.90 kW and 4.25 kW.h/fed were obtained with forward speed of 1.82 km/h.

Cost of the mechanical planting.

The operation and production costs at optimum forward speed of 2.97 km/h were 65.7 Egyptian pound/h and 96 Egyptian pound/fed.

CONCLUSION

The optimum forward speed of tested planter for sesame coated-seeds planting was 2.79 km/h which gave the following results: seed emergence of 83.2 %, missing hills of 2.5 %, double seeds of 5 %, effective field-capacity of 0.68 fed/h, field efficiency of 80.62 %, seed yield of 887 kg/fed, press-wheel slip of 4.87 %, power of 3.1 kW, specific energy of 4.53 kW.h/fed, operation cost of planter and tractor of 65.7 Egyptian pound/h and production cost of 96 Egyptian pound/fed.

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دراسة بعض العوامل المؤثرة على الزراعة الميكانيكية لبذور السمسم المغطاة

إبراهيم يحيى السيد[1] ، عاشور عيد أبو المعاطى[2]* و[2]ياسر السيد عبد الفتاح[1]

[1]معهد بحوث الهندسة الزراعية.

[2]كلية الهندسة الزراعية ـ جامعة الأزهر بأسيوط.

يهدف هذا البحث إلى دراسة العوامل المؤثرة على الزراعة الميكانيكية لبذور السمسم المغلطاة. وكانت عوامل الدراسة كالتالى:التجارب المعملية: تم فيها دراسة العوامل الآتية: خمس سرعات لجهاز التلقيم: 20، 30، 40، 50، 60 لفة/د(0,21، 0,31، 0,42، 0,52، 0,63 م/ث)، وتم دراسة هذه العوامل على معدل التلقيم، وتلف البذور ونسبة الإنبات. التجارب الحقلية: تم فيها دراسة تأثير أربع سرعات أمامية وهي 1,82، 2,97، 3,84، 4,79 كم/ساعة على نسب الإنبات فى الحقل، انتظامية توزيع النباتات على طول الخط، الإنتاجية، انزلاق عجلة التغطية (التي تنقل الحركة لجهاز التلقيم)، متطلبات القدرة والطاقة، السعة الحقلية النظرية والفعلية والكفاءة الحقلية، وحساب تكاليف الزراعة بالآلة. وكانت أهم النتائج المتحصل عليها كالتالى: (1) نتائج التجارب المعملية: (أ) تصرف البذور: وجد أن أقصى تصرف للبذور المغلفة هو 4.12 كج/فدان عند سرعة جهاز التلقيم 20 لفة/د. بينما تم الحصول على أقل معدل تلقيم وهو 2.89 كج/فدان عند سرعة جهاز التلقيم 60 لفة/د. (ب) التلف الظاهرى للبذور: وجد أن أقصى تلف للبذور المغلفة هو 3.89 % عند سرعة جهاز التلقيم 60 لفة/د. بينما تم الحصول على أقل تلف بذور وهو 0.37 % عند سرعة جهاز التلقيم 20 لفة/د. (ج) نسبة الإنبات فى المعمل: وجد أن أقصى نسبة إنبات في المعمل للبذور المغلفة 85.2 % عند سرعة جهاز التلقيم 20 لفة/د. بينما تم الحصول على أقل نسبة إنبات فى المعمل للبذور المغطاة وهي 77.2 % عند سرعة جهاز التلقيم 60 لفة/د.(2) نتائج التجارب الحقلية:(أ) نسبة الإنبات فى الحقل (بزوغ البادرات): وجد أن أقصى نسبة إنبات في الحقل (بزوغ البادرات) للبذور المغطاة هي 88.4 % عند سرعة أمامية 1.82 كم/س. بينما تم الحصول على أقل نسبة إنبات فى الحقل (بزوغ البادرات) للبذور المغطاة وهي 77.1 % عند سرعة أمامية 4.79 كم/س.(ب) انتظام توزيع البذور على طول الخط: وجد أن أنسب سرعة أعطت أفضل انتظامية بذور على طول الخط هي سرعة أمامية 2.97 كم/س، حيث أعطت متوسط مسافة بين النباتات 10.1 سم ومعامل أختلاف 6.2 %. (ج) نسبة الجور الغائبة ونسبة النباتات المزدوجة: وجد أنه بزيادة السرعة الأمامية من 1.82 إلى 4.79 كم/س زادت نسبة الجور الغائبة من 1.25 إلى 4.5 وقلت نسبة البذور المزدوجة من 21.7 إلى 1.25.(د) نسبة الانزلاق: وجد أن أقصى نسبة انزلاق هي 7.24 % تم الحصول عليها باستخدام سرعة أمامية مقدراها 4.79 كم/س. بينما تم الحصول على أقل نسبة انزلاق هي 4.11 % باستخدام سرعة أمامية مقدراها 1.82 كم/س.(هـ) إنتاجية المحصول الكلية: وجد أن أقصى إنتاجية محصول لبذور السمسم المغطاة 912 كج/فدان تم الحصول عليها باستخدام سرعة أمامية مقدراها 1.82 كم/س. بينما تم الحصول على أقل إنتاجية بذور سمسم مغطاة 577 كج/فدان باستخدام سرعة أمامية مقدراها 4.79 كم/س.(و) السعة الحقلية الفعلية والكفاءة الحقلية: وجد أن أقصى سعة حقلية فعلية 1.02 فدان/س تم الحصول عليها باستخدام سرعة أمامية مقدراها 4.79 كم/س. بينما تم الحصول على أقل سعة حقلية فعلية 0.45 فدان/س باستخدام سرعة أمامية مقدراها 1.82 كم/س. بينما وجد أن أقصى كفاءة حقلية 85.86 % تم الحصول عليها باستخدام سرعة أمامية مقدراها 1.82 كم/س. بينما تم الحصول على أقل سعة حقلية فعلية 74.51 % باستخدام سرعة أمامية مقدراها 4.79 كم/س.(ز) متطلبات القدرة والطاقة النوعية: وجد أن أقصى متطلبات للقدرة والطاقة النوعية هي 1.56 5.0 كيلووات، 4.9 كيلووات.س/فدان تم الحصول عليها باستخدام سرعة أمامية مقدراها 4.79 كم/س. بينما تم الحصول على أقل متطلبات للقدرة والطاقة النوعية 1.90 كيلووات، 4.25 كيلووات.س/فدان باستخدام سرعة أمامية مقدراها 1.82 كم/س.(ح) تكاليف استخدام آلة الزراعة: وجد أن تكاليف تشغيل "آلة الزراعة + الجرار" وتكاليف الإنتاج عند أنسب سرعة أمامية 2.97 كم/س هي 65.7 جنيه/س، 96 جنيه/فدان على التوالي.يوصى باستخدام آلة الزراعة لبذور السمسم المغلفة على سرعة أمامية 2.79 كم/س والتى أعطت أنسب أداء للآلة وهي: نسبة إنبات في الحقل 83.2 %، السعة الحقلية الفعلية 0.68 فدان/س، تكاليف إنتاج 96 جنيه/فدان.