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THE UTILIZATION OF A METERING PLATE DEVICE FOR COWPEA PLANTING

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ABSTRACT

This study is carried out to evaluate the actual relationship between the three hole areas (9.62, 15.90 and 23.76 mm^2) and the feeding device parameters (seeding speed, peripheral speed of metering wheel device. The hole of feeding device was controlled by seed lever control which lies in seed tank bottom. All parameters were measured at constant level of seed brush parameters. Quality of feed, miss, multiple indexes and preciseness of seed index are the most common characteristics used to evaluate the metering wheel device performance. Varies physical properties of seeds including seeds density, projected area, sphericity and one thousand seeds mass are the most important factors in determining the optimum levers dimensions for metering device. The highest seed feed index was achieved on the seed plate with oblong holes (A_{ob2}) for all cowpea moisture content (M_1 of 64.45%; M_2 of 56.13% and M_3 of 49.74%), and the plates with circular holes followed this. The lowest seeding feeding ratio was obtained from the experiments using the plates with oblong hole (A_{ob1}). The highest seed feed index was with moisture content (M_1=86.08%) at 1.0 km/h, whereas the lowest the seed feed index was with M3 (46.21%) at 4.0 km/h. When the seed feed index was 86.73%, 79.77% and 74.56% for M1, M2 and M3 cowpea moisture content at 1.0 km/h planting speed, the seed feed index reached 71.04%, 61.07% and 46.21%, respectively, in a planting speed of 4.0 km/h. The changing planting speed had a greater effect on the feed index of M3 cowpea seed on the other 2 seed moisture content.

Keywords: planter, seed device, bean planting, horizontal wheel device, seed lever control and systems analysis of seed feeding

INTRODUCTION

Cultivation of Bean is done mostly during the summery season. Seeds are sown in rows of about 50to 60cm apart and plants are spaced about 10 ±3 cm apart within rows (closer row spacing). Seeds may be soaked to soften the hard seed coat and induce better germination (Dessai et al. 1997). Sowing bean by hand increases production cost as extra man-hours is required for thinning operation as excessive seed is inevitably sown per hill. Moreover, the traditional planting method is tedious, causing fatigue and backache due to the longer hours required for careful hand metering of seeds if crowding or bunching is to be avoided.

Kumar et. al. (1986) developed a manually operated seeding attachment for an animal drawn cultivator. The seed rate was 43.2 kg/hr while the field capacity was 0.282ha/h. Tests showed minimal seed damage with good performance for wheat and barley. Simalenga and Hatibu (1991) tested the hand planter on the field and found the work rate of the planter to be between 18 man-hours per hectare and 27man-hour per hectare (60 man-h per feedan) when using conventional hand-hoe planting method. Gupta and Herwanto (1992) designed and developed a direct paddy seeder to match a two-wheel tractor. The machine had a field capacity of about 0.5ha/h (1.0 feed/h) at a forward speed of 0.81m/s. Ladeinde and Verma (1994) undertook a study to compare the performance of three different models of jab planters with the traditional method of planting. In terms of field capacity and labour requirements, there was not much difference between the traditional planting method and the jab planters. However, backache and fatigue were substantially reduced while using the planters.

Molin and D'Agostini (1996) developed a rolling punch planter for stony conditions, using 12 spades radially arranged with cam activated doors and a plate seed meter. In crop production, the main condition for high productivity depends on seeds being in the optimum living area. In other words, it is necessary for seeds to be placed at equal intervals within row. With uniform spacing, the roots can grow to a uniform size (Karayel and Ozmerzi-2001 and Pannig -1997).

Although there are many planters having different seed metering units, the application of pneumatic single seed planters has rapidly increased due to the fact that their seeding performance is better than that of the others. In additions, the devices of mechanical seed metering used in conventional drills are not capable of operating at high travel speed (Soos et al. -1989). Preliminary evaluation showed important improvement in the planting operation with reduction in human effort, more accurate stands and high field capacity. To attain optimum planting condition for productivity, Pradhan et al. (1997) developed a power tiller-operated groundnut planter unfertilized drill with an actual field capacity of 0.160 ha/h. (0.4 feed/h).

Cowpea cultivation has been limited to manual planting, which is very tedious and labourious. There is therefore a need to develop a simple tool that will be used in planting bean seeds. The conveying seeds in horizontal wheel device face many factors affecting the performance of conveying bean seeds (Ismail-2004). The lever control in the seeds tank bottom and the amount of feeding device parameters are considers as the main static factors influence of the seeding performance. While, the spacing uniformity, seed volumetric rate and irregular dispersion of seeds in soil for bean planting are considers as the main out let factors.

Therefore, this work is aimed at evaluating a simple manually operated bean seed planter designed by the authors to alleviate the burden of bean planting.

MATERIALS AND METHODS

1- The Soil Bin Description

The soil pin is designed specifically for tests and evaluation the feeding seeds devices. It was constricted in Ag. Eng. Department, Mansoura University. The metering device was connected to suit on soil pin of laboratory experiments. The experimental metering system components are: seed hopper; metering device and oscillating seed tube. The soil pin view is shown in Fig. (1). The main parts of soil bin are as follows: frame, variable-speed feeder, mobile trolley and power transmission.

The mobile trolley is considered the base at which the investigated feeding device fixed on the soil bin frame. The motion was supplied to trolley by close transmission wire system (Fig. 1). Four bearing were fixed on the rod of trolley to over com the trolley resistance. The case of bearing was designed to easy run on the two parallel rail rods. The test-trolley was powered by electrical motor of 10kW, which transmit the motion to the trolley by two individual reductions gears to simulate the speed of the planting seeds in the field.

2- The Metering System Components

The metering system is cosmists of the following parts:-

A- Seed hopper

The individual seed hopper tank was made from fiberglass is illustrated as shown in Fig. (2). it's connected on the planter frame. On the hopper tank bottom the control lever is connected to regulate the seeding out. The single brush is lied on seed tank bottom (Fig. 3) to control the seed discharge number per hole.

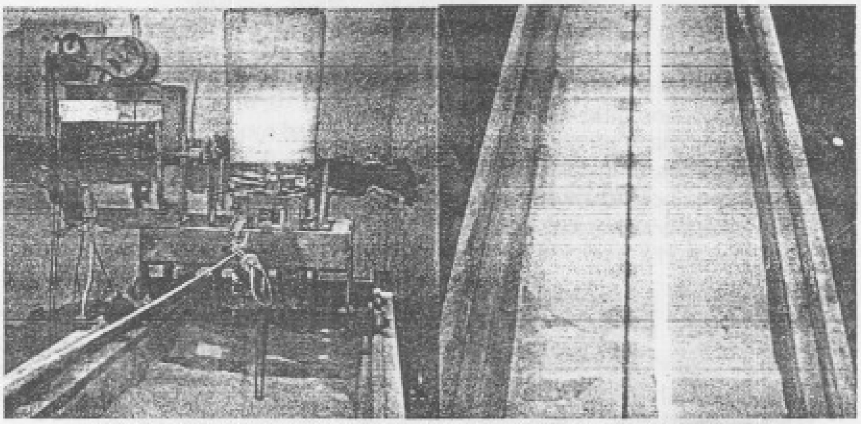

Fig.(1): The investigated planter on Soil Bin (Ismail, 2009)

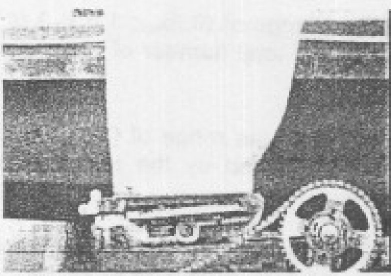

Fig. (2): the seed hopper tank

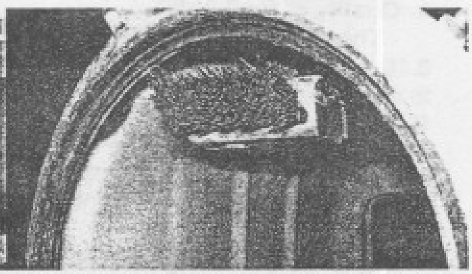

Fig.(3): The seed discharge brush control

B- Feeding device

Metering devices: A vertical-axis metering-wheel with grooves was used as shown in Fig. (4). Cell grooves were located at the equal space on the circumference of feeding disc. The press disc is sited on the press ring to control the number of seeds per one revolution. A few seed are picked by each groove from the hopper and dropped into the seed tube. The revolution number of seeding disc can be regulated be using the power transmission of the soil bin as shown in Fig. (1).

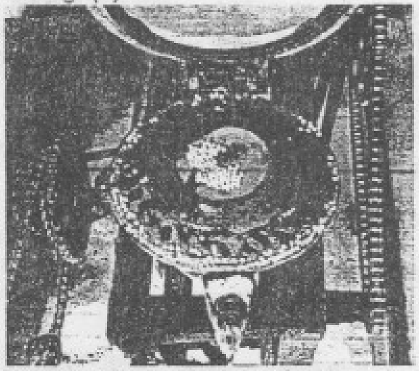

Fig. (4): The metering wheel device

3- The Operation Parameters of Investigated Device are:-

1- Four peripheral velocities of seed plate (0.16, 0.24, 0.32 and 0.40 m s^{-1}),
2- Two hole shapes of seed plate (oblong and round),
3- Four traveling speeds of planter (1.0, 2.0, 3.0 and 4.0 km/h),
4- Three hole areas (9.62, 15.90 and 23.76 mm^2) and
5- Three cowpea seeds with different thousand seed mass (268.53, 364.86 and 372.51 g 1000^{-1} seeds) were chosen as the operating parameters.

4- Effects on Seeding Indices

Seeding indices were calculated according to Kachman and Simth (1995). These indices were quality of feed index, miss index, and precision index. During the lab trials, it was observed that the peripheral speed of feeding seed disc affect seed spacing. Higher linear speed and the less peripheral speed would result in more space between seed in row.

A- Quality of feed index

The number of seeding distance in the range of ($0.5x_{ref}$; 1.5 x_{ref}) or "0.1-0.10 m" in this experiment was divided by the total number of planted seeds to obtain quality of feed index (Servastava 995).

B- Miss index

The number of seedling distance placed in the range of (1.5 x_{ref}, E_m) or (0.15 - E_m) meter in this experiment was divided by the total number of planted seeds to obtain percent miss index.

C- Multiple index

It is the percentage of spacing that are less than or equal to half of the theoretical spacing and indicate the percentage of multiple seed drops.

D- Preciseness index

Preciseness index for each treatment was obtained by dividing the standard deviation of distances in the range of ($0.5x_{ref}$, $1.5x_{ref}$) by x_{ref}. This index is the measure of variability in spacing between seed after accounting for variability due to both multiples and skips. Lower values for this index indicate better performance of the metering device.

Varies physical properties of seeds including seeds density, projected area, sphericity and one thousand seeds mass are the most important factors in determining the optimum levers dimensions for metering device. The physical properties of the seeds were determined by the following methods:- Linear dimensions, i.e. length, thickness and width were measured by using a electrical caliper with a sensitivity of 0.01mm. sphericity "Q" were calculated by using the following equation (Mohsenin,1970).

$$Q = ((LWT)^{0.334}/L)\ (100)$$

Where: L is the length; W is the width; and T is the thickness in mm.

The geometric diameters " d_g" is calculated from Eq. $(L.W.T)^{1/3}$ and $d_a = (L+W+T)^{1/3}$ and, $a_{fs} = \pi\ (d_g)^2$ and $a_{ts} = (\pi/2)\ (L+d_g)\ (d_g)$ and $S_p = (d_g/L)\ (100)$. One thousand seeds mass was measured by an electronic balance with a sensitivity of 0.001g. Seeds density was measured by the Moatouk methods (2003). Projected area was determined by using a Excel Program.

For the estimation of the seed out hole control, in relation to seeds density, project area, sphericity and one thousand seed mass, mathematical model were developed. The suitability of the final model was compared and evaluated using chi-square x^2, root mean square error E_{rms} and modeling efficiency E_m were calculated as follows:-

$$E_{rms} = \sqrt{\frac{\sum_{i=1}^{N}(K_{pre,i} - K_{\exp,i})^2}{N}}$$

$$X^2 = \frac{\sum_{i=1}^{N}(K_{\exp,i} - K_{pre,i})^2}{N-n}$$

$$E_m = \frac{\sum_{i=1}^{N}(K_{\exp.i} - K_{\exp,mean})^2 - \sum_{i=1}^{N}(K_{pre,i} - K_{\exp,i})^2}{\sum_{i=1}^{N}(K_{\exp,i} - K_{\exp,mean,i})^2}$$

Where: K_{exp} is the experimental seed holes dimension in mm; $K_{exp,mean}$ is the mean value of experimental seed holes in mm; K_{pre} is the predicted seed hole control by bottom lever in mm; N is the number of observation; and n is the number of population in the model.

Reduced chi-square is the mean square of the deviation between the experimental and calculated values for the models and, is used to determine the goodness of the fit. The lower values of the reduced chi-square, the better the goodness of the fit. The root mean square error shows the deviations between the calculated and experimental values and it requires reaching zero. The modeling efficiency also shows the ability of the model and its highest values is 1 (Yaldiz, 2004).

The data were statistically analyzed to determine the effect of the traveling speed of horizontal wheel device under two different of the open lever control on performance indices. Namely, mean seed spacing, miss and multiples indexes, quality of feed index, precisions in spacing and the amount of seed rate. The ASA programming was used to analyses the obtained data under different variables.

RESULTS AND DISCUSSION

1- Physical properties of cowpea seeds

Seeds density, projected area, sphericity and one thousand seeds mass for cowpea variety of Dokki 331 are illustrated in tables (1 and 2). From tables the projected area for cowpea is ranged with average of (43.0 mm^2) and stander deviation of ±0.45 mm^2. The specific of mass, seed of cowpea density, sphericity,% and the seed projected area are found of 7.0 g; 1110 ± 11 kgm^{-3} ; 85.8 ± 0.48% and 43.0 ± 0.4 mm^2 respectively.

Table 1: Some of physical and mechanical properties of cowpea seeds

L, mm	W, mm	T, mm	M, g	d_g, mm	d_a, mm	a_{fs}, mm	a_{ts}, mm	S_p, %	MC, %
10.7	6.5	5.5	0.268	7.25	7.57	164.81	204.11	67.71	49.74
10.8	6.9	5.9	0.364	7.59	7.87	180.82	219.08	70.27	56.13
11.2	7.1	6.3	o.372	7.93	8.20	197.25	238.00	70.77	64.45

Where:- L: length, W: width, T: thickness, M: mass, d_g: geometric diameters, d_a: arithmetic diameters., a_{fs}: area of flat surface, a_{ts}: area of transverse surface, s_p: spherically, and MC: moisture content dry basis

Table 2 : The mechanical properties of cowpea seeds

Specific mass, g	Angle of repose, degree	Friction angle, degree*	Rigidity force, N	Terminal velocity, m/s
7.0 ± 0.35	22.91 ± 2.18	23.6 ± 1.16	80.82 ± .82	8.18 ±0.98

* Friction angle with sheet metal surface.

Three cowpea seeds with different thousand seed mass (268.53, 364.86 and 372.51 $g1000^{-1}$ seeds) were chosen as the operating parameters. These were obtained by changing the moisture seed content (M_1 = 49.74%; M_2 = 56.13% and M_3 = 64.45%).

Effect of thousand seed mass on the seed loses

The relationship between the thousand seed mass as referring in seed moisture content are illustrated in Fig. (5) at different seed project areas of feeding disc (42; 78; and 114 mm^2). Generally, increasing the thousand seed mass increasing the seed loses during planting operation. Also, the same trend was found during increasing the holes of feeding disc. The main widely was found in between the 260-370 g 1000^{-1}seeds. For the determination of the relationship between the one thousand seed mass and the projected area of feeding plate, the power model was used. It may be found as the following:-

$$S_L = 2E\text{-}07\ W^{3.0022} \qquad R^2 = 0.9292$$

Where, S_L is the seed loses, and W is the one thousand seed mass, g 1000^{-1} seeds

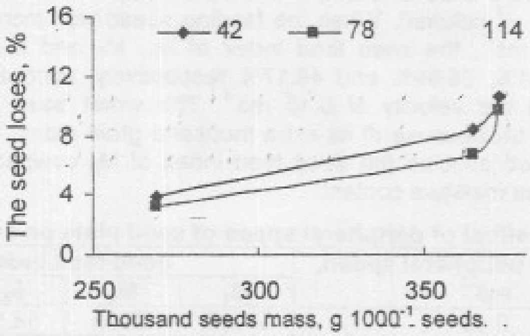

Fig. 5: The one thousand seed mass via seed loses

2- Effects on seeding indices

A: Quality of feed index

*** The effect of shape of seed plate holes on the feed Index**

The seed feed index was evaluated as the ratio. According to the results of the variance analysis for all cowpea seed moisture content, area of holes affected the seed feed index at 1% ($P < 0.01$) significance. In addition, as a result of Duncan's test (x^{-1}), the differences between the seed feed index of hole shapes were statistically significant for the 3 cowpea moisture content (Table 3). The highest seed feed index was achieved on the seed plate with oblong holes (A_{ob2}) for all cowpea moisture content (M_1 of 64.45%; M_2 of 56.13% and M_3 of 49.74%), and the plates with circular holes followed this. The lowest seeding feeding ratio was obtained from the experiments using the plates with oblong hole (A_{ob1}).

Table 3: The effect of hole shape on seed feed index

Hole shape	Seed feed index; %			
	M_1	M_2	M_3	X^{-1}
Ar (round)	83.064	76.850	69.089	76.33
A_{ob1} (oblong-1)	80.564	74.871	66.780	74.07
A_{ob2} (oblong-2)	89.456	81.123	74.789	81.79

* Differences at 1% level

*** The effect of the peripheral speed of the seed plate on seed feed index**

For each cowpea moisture content, it was determined that the peripheral speed of the seed plate was affected by the seed feed index at 1% ($P < 0.01$) significance and there were statistical differences between the seed feed index means of the seeds (Table 4). An increase in the peripheral speed of the seed plate caused seed feed index to drop. In other words, when the peripheral speed of the seed plate increased, the empty feed number on the seed plate also increased. The highest seed feed index was achieved in M_1 (71.76%) at the plate speed of 0.16 ms^{-1}, whereas the lowest seed feed index was obtained in M_3 moisture (29.75%) at the speed of 0.40 ms^{-1}. As can be seen from Table 4, the seed feeding index decreased with an increase in the plate speed for different cowpea moisture content. Based on thousand grain mass, there were important differences between the seed feed index means of cowpea (at x^{-2} column). When the feeding speed was increased from 0.16 ms^{-1} to 0.40 ms^{-1}, the seed feed index of M_1, M_2 and M_3 cowpea seeds dropped 38.44%, 35.69% and 49.17% respectively, according to the seed feed index in the .velocity of 0.16 ms^{-1}. The worst seed feed index was obtained with M_3 because of its extra thousand grain mass. The changing of the plate speed affected the seed feed index of M_3 cowpea more than the other 2 cowpea moisture content.

Table 4: The effect of peripheral speed of seed plate on seed feed index

Seed plate peripheral speed, ms^{-1}	Seed feed index; %			
	M_1	M_2	M_3	X^{-1}
0.16	71.85	63.05	58.52	64.47 d
0.24	63.71	56.04	49.3	56.35 c
0.32	55.26	48.03	39.2	47.50 b
0.40	44.17	40.45	29.75	38.12 a
X^{-2}	58.75	51.90	44.20	51.61

* Differences at 1% level

*** The Effect of planting speed on the seed feed index**

It was found that the planting speed (1.0, 2.0, 3.0 and 4.0 km/h) affected the seed feed index at 1% ($P < 0.01$) significance. The differences between the seed deed index means of the planting speed levels (x^{-1}) were significant according to the results of Duncan's test (Table 5). The planting speed affected the seed feed index. It is in inversely proportion and while the planting speed was increasing the value of the seed index also decreased. As shown in Table 5, the highest seed feed index was with M_1 (86.08%) at 1.0 km/h, whereas the lowest the seed feed index was with M_3 (46.21%) at 4.0 km/h. When the seed feed index was 86.73%, 79.77% and 74.56% for M_1, M_2 and M_3 cowpea moisture content respectively at 1.0 km/h planting speed, the seed feed index reached to 71.04%, 61.07% and 46.21%, respectively, in a planting speed of 4.0 km/h. The changing planting speed had a greater effect on the feed index of M_3 cowpea seed on the other 2 seed moisture content.

Table 5: The effect of planting speed on the feed index

Planting speed, kmh^{-1}	Seed feed index; %			
	M_1	M_2	M_3	X^{-1}
1.0	86.73	79.77	74.56	80.35
2.0	76.52	60.36	60.34	65.74
3.0	56.28	46.87	35.98	46.38
4.0	71.04	61.07	46.21	59.44
X^{-2}	72.65	62.08	54.27	62.98

* Differences at 1% level

B: Quality of Miss Index

*** The effect of shape of seed plate holes on the miss index**

The relationship between the shape of seed plate holes and the amount of cowpea seed on the seed miss index at different seed moisture content are illustrated in Fig. (6). The general trend of above treatment is that, as increasing the seed plate holes areas decreasing the seed miss index. The rate of decreasing was 0.87 times.

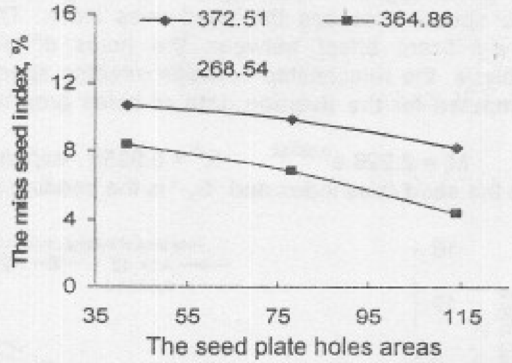

Fig. 6: Effect of seed plate holes on the miss index at different thousand seed mass

*** Effect of the peripheral speed of the seed plate on the misses Index**

Fig. 7 illustrates the relationship between the values of seed miss index and the feeding disc peripheral speed. An increase in the peripheral speed of the seed plate caused seed miss index to improve. In other words, when the peripheral speed of the seed plate increased, the empty feed number on the seed plate also increased. The highest seed miss index was achieved in A_1 (12.4%) at the plate speed of 0.4 ms^{-1}, whereas the lowest seed miss index was obtained in A_3 area of feeding plate (114mm^2) at the speed of 0.40 ms^{-1}.

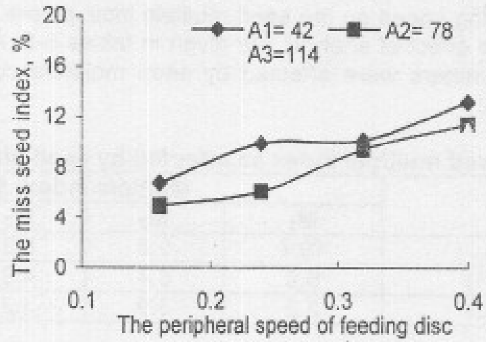

Fig. 7: The effect of peripheral speed on the seed miss index.

The power regression for above relation was found as follows:-

$y = 23.679\, x^{0.6713}$ R2 = 0.93   at A_1

$y = 26.794\, x^{0.9545}$ $R^2 = 0.95$ at A_2

$y = 34.176\, x^{1.3815}$ $R^2 = 0.95$ at A_3

Where: y is the seed miss index and x is the feeding disc peripheral speed

*** The Effect of planting speed on the seed miss index**

Data in fig. 8 demonstrate the effect of planting speed on the amount of seed miss in percentages. Increasing the planting speed with constant peripheral disc speed increases the seed miss index. The data analyses indicated no significant effect between the holes differences. By using regression analysis, the relationship between seeding speed and seed miss index was computed for the average data of holes area of feeding disc as follows:

$$M_i = 2.226\, e^{0.365Ss} \qquad R^2 = 0.9355 \quad \text{exponential relationship}$$

Where, "M_i" is the seed miss index and "S_s" is the seeding speed.

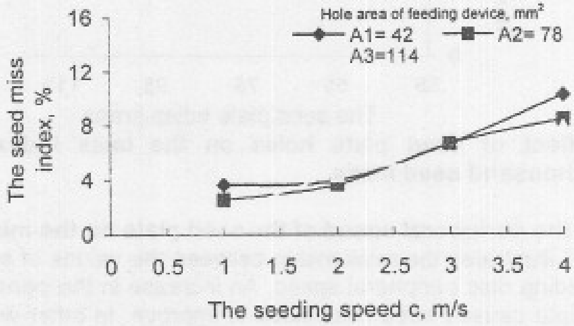

Fig. 8: The Effect of seeding speed on the seed miss index

C: Quality of multiple Index

The effect of shape of seed plate holes, peripheral speed of the seed plate and planting speed on the seed multiple indexes are illustrated in fig (9) and the domino effect of analysis are given in tables 6-8. All measurement of operation parameters were affected by seed moisture content and feeding disc holes area.

Table 6: the seed multiple index as affected by seed plate hole shape

Hole shape	Multiple index; %			
	M_1	M_2	M_3	X^{-1}
Ar (round)	10.7	9.8	8.2	9.57
A_{ob1} (oblong-1)	6.8	8.4	4.3	6.50
A_{ob2} (oblong-2)	2.2	3.9	3.2	3.10

Table 7: The seed multiple indexes as affected by plate peripheral speed

Seed plate peripheral speed, ms^{-1}	Seed multiple index; %			
	Ar (round)	A_{ob1} (oblong-1)	A_{ob2} (oblong-2)	X^{-1}
0.16	7.4	8.1	11.2	8.90 d
0.24	9.2	11.7	12.2	11.03 b
0.32	13.3	18.6	11.4	14.43 c
0.40	16.0	22.0	18.2	18.73 a
X^{-2}	11.48	15.10	13.25	13.28

Table 8: The effect of planting speed on the multiple indexes

Planting speed, kmh^{-1}	The multiple index; %			
	Ar (round)	A_{ob1} (oblong-1)	A_{ob2} (oblong-2)	X^{-1}
1.0	13.4	10.4	17.9	13.90
2.0	12.8	9.8	16.7	13.10
3.0	11.2	8.23	15.1	11.51
4.0	8.1	7.42	13	9.51
X^{-2}	11.38	8.96	15.68	12.00

* Differences at 1% level

The data analysis in tables show that holes shape, seed plate peripheral speed, ms^{-1} and planting speed (1.0, 2.0, 3.0 and 4.0 km/h) affected the multiple index at 1% ($P < 0.01$) significance. The differences between the seed multiple index means of hole shape, peripheral speed and planting speed levels (x^{-1}) were significant according to the results of Duncan's test (Table 7, 8 and 9). The relation in Fig. 9 indicated that the seed multiple index decreased by increasing each of seed plate holes area and seeding speed but the decreasing rate as affected seeding speed is more than that the hole area affect and the vice versa at increase the peripheral speed of feeding disc.

D: Quality of preciseness Index

Data in Fig. (10) demonstrate the effect of seed plate holes, peripheral speed and planting speed on the amount of seed preciseness in percentages. Increasing the planting speed with constant peripheral disc speed decreases the seed space distance. Consequently, the percentage of seed preciseness is decreased until average seeding speed of 2.1 km/h after than the preciseness index increased. The same trend is found at affecting the peripheral speed.

The data analysis in tables show that holes shape, seed plate peripheral speed, ms^{-1} and planting speed (1.0, 2.0, 3.0 and 4.0 km/h) affected the preciseness index at 1% ($P < 0.01$) significance. The differences between the seed multiple index means of hole shape, peripheral speed and planting speed levels (x^{-1}) were significant according to the results of Duncan's test (Table 10, 11 and 12).

Table 9: the hole shape in relation to preciseness index

Hole shape	Preciseness index; %			
	M_1	M_2	M_3	X^{-1}
Ar (round)	15.3	11.6	10.8	12.57
A_{ob1} (oblong-1)	16.5	12.9	10.2	13.20
A_{ob2} (oblong-2)	17.2	12.4	11.6	13.73

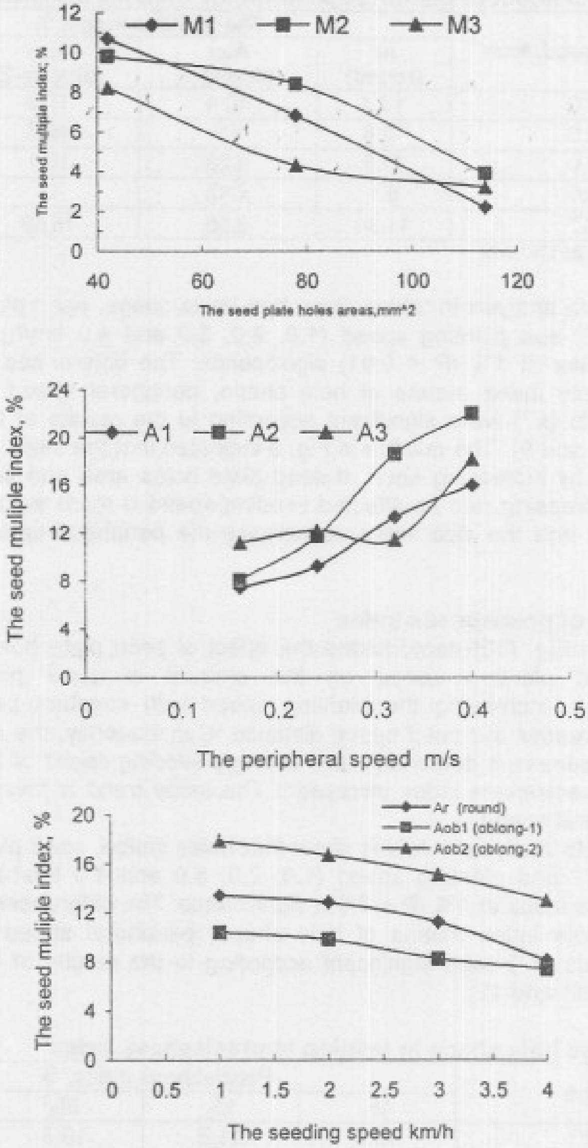

Fig. 9 : The effect of shape of seed plate holes, peripheral speed and seeding speed on the multiple indexes

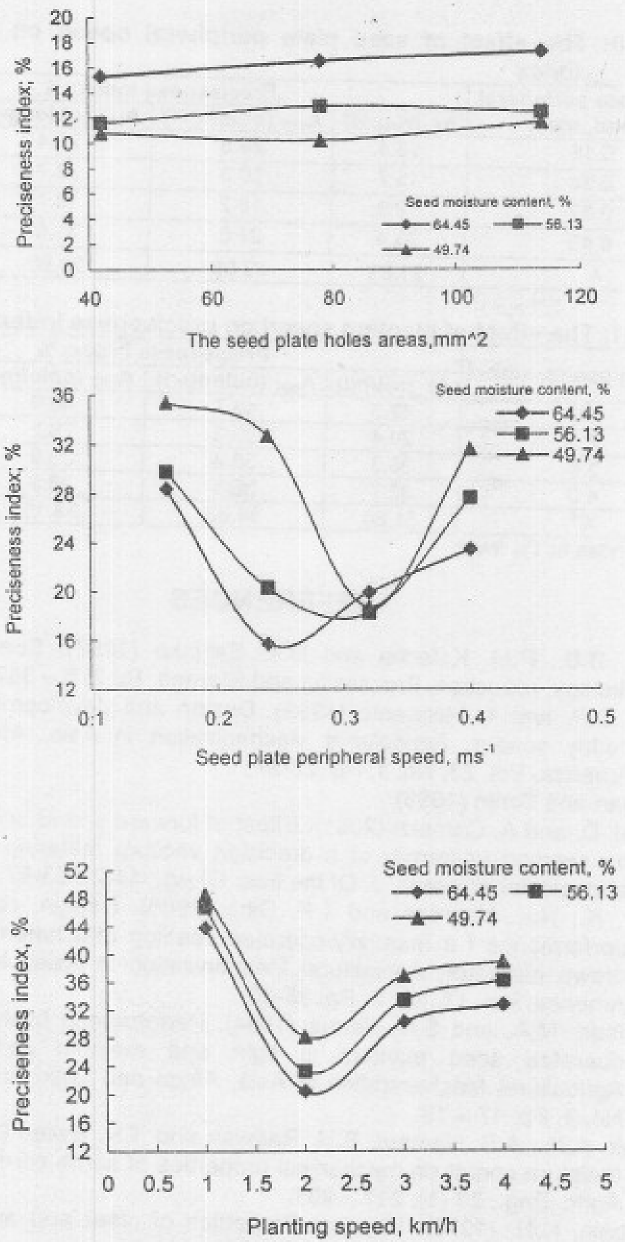

Fig. 10: The effect of shape of seed plate holes, peripheral speed and seeding speed on the preciseness indexes

Table 10: The effect of seed plate peripheral speed on preciseness index

Seed plate peripheral speed, ms-1	Preciseness index; %			
	Ar (round)	A_{ob1} (oblong-1)	A_{ob2} (oblong-2)	X^{-1}
0.16	28.4	29.8	35.4	31.2
0.24	15.7	20.3	32.7	22.9
0.32	19.9	18.2	18.7	18.93
0.40	23.4	27.6	31.6	27.53
X^{-2}	21.85	23.98	29.60	25.14

Table 11: The effect of planting speed on preciseness index

Planting speed, kmh-1	Preciseness index; %			
	Ar (round)	A_{ob1} (oblong-1)	A_{ob2} (oblong-2)	X^{-1}
1.0	43.8	46.7	48.6	46.37
2.0	20.4	23.3	28.2	23.97
3.0	30.3	33.4	36.9	33.53
4.0	32.7	36.1	38.9	35.90
X^{-2}	31.80	34.88	38.15	34.94

* Differences at 1% level

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استخدام وحدة التلقيم القرصية لزراعة محصول اللوبيا

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كثير من المحاولات تم تنفيذها لاستخدام آلات الزراعة الحالية لزراعة محصول اللوبيا الا ان جميع تلك المحاولات لم تحقق تحسين فى أداء العملية وأدت إلى صورة عكسية ترجمت بنقص المحصول لذلك كانت المحاولة الجادة عن طريق استخدام فتحات ذات أبعاد مختلفة لغرض التلقيم (دائرى مساحة ٤٢,٢٨ – بيضاوي بمساحة ٧٨,٢٨، ١١٤,٢٨ مم^{٢}) حيث تم التحكم فى الفتحه باستخدام رافعة مزودة في قاع التغذية. وأيضا تم تثبيت فرشاة وذلك للمحافظة على وصول بذرة واحدة الى تلك الفتحة. أيضا تم استخدام سرعات تقدم مختلفة على سرعات دورانية مختلفة لقرص التلقيم.

اشتملت أهم النتائج على أن تحسين أداء العملية زاد وذلك بدراسة العوامل الطبيعية المؤثرة على عملية الاستزراع. وجد أن زيادة السرعة الدورانية وكذلك سرعة التقدم تؤثر بطريقه عكسية على كل من الغياب والتوزيع وطردية على عامل الضعف.