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Influence of Mechanical Harvesting Process on Productivity and Quality of Cotton Fiber

El-Yamani, A. E. ; S. A. Marey and I. F. Sayed-Ahmed
Agricultural Engineering Research Institute (AENRI), Agricultural Research Center, P.O Box 256 Dokki, Giza, Egypt.

ABSTRACT

The aim of this study is to evaluate and compare the performance of two different types of cotton pickers, namely the John Deere model 7260 and the Pamuk brand cotton harvesting machine model ptm2. Therefore, field experiments were conducted to investigate the effects of four mean forward speeds of 1.32 ,1.66, 1.87, and 2.15 km h^{-1}, three fiber moisture contents of 13.3, 10.8, and 8.7% d.b, and three inter-row spaces of 0.70, 0.76, and 0.85 m. on the picking losses, machine productivity, specific energy consumption and fiber physical properties. The results showed that the minimum values of the picking losses were 0.8 and 4.5 % for the John Deere and Pamuk cotton pickers respectively recorded at a forward speed of 1.32 km/h, a fiber moisture content of 10.8% d.b., and an inter-row spacing of 0.85 m. The maximum values of machine productivity of the John Deere and Pamuk cotton pickers were 2.1 and 0.995 Mg h^{-1}, respectively, at a forward speed of 2.15 km h^{-1}, a fiber moisture content of 10.8%, and an inter-row spacing of 0.76 m. The lowest values for the specific energy consumption were 23.07 and 30.69 kW h Mg^{-1} for the John Deere and Pamuk cotton pickers, respectively, at a forward speed of 2.15 km/h, a fiber moisture content of 8.7 % d.b., and an inter-row spacing of 0.85 m. Also, At a forward speed of 1.32 km/h, fiber moisture content of 13.3% and an inter-row spacing of 0.76 m. both cotton pickers achieved the maximum values of 2.5% span fiber length, 50 % span fiber length, fiber length uniformity ratio and reflectance and minimum values of seed cotton trash content and yellowness.
Keywords: cotton pickers, mechanical picking loss, energy requirements, fiber physical properties.

INTRODUCTION

Cotton harvest is the process of collecting mature crops. Manual picking is slow but preserves the fiber characteristics. Manual harvesting is very popular in small holding farms. On the other hand, the mechanized methods are popular in large-scale farming. It is a more economic and time efficient method, but because of the lack of synchronization of cotton plant maturity, harvesting is not so efficient.

Some of the largest producers and exporters of cotton lint, such as the USA, Australia, and Brazil, wholly harvest their cotton mechanically (Anon, 2011). To make it more efficient, we have to do some additional tasks such as defoliant application using harvest aids (Ferruh *et al*., 2009). Harvest aid is a general term used to describe chemicals applied to terminate cotton growth. The adoption of mechanical cotton harvesters was mainly due to an increase in cotton acreage and yield, which resulted in an intense increase of cotton production (ICAC, 2004).

Two types of pickers cotton are common used today: the stripper picker that removes the lint from the plant and the spindle picker. The spindle picker uses rows of barbed spindles that rotate at high speed and remove the seed-cotton from the plant. The seed cotton is then removed from the spindles using a counter-rotating doffer and blown into a basket. Brush strippers are less expensive and require less maintenance than that required by spindle harvesters. However, it harvests more material than spindle harvesters do, but lower gin turnout is expected (Deshmukh and Mohanty, 2016), because of the increased levels of foreign materials in the seed cotton harvested by the brush stripper (Brashears and Hake. 1995).

Several studies have compared the seed cotton and lint yields of cotton harvested with both pickers and strippers. Vories and Bonner (1995) and Yates *et al*. (2007) compared the spindle pickers with strippers. They detected a significant difference in seed cotton yield, but the harvest efficiency was not reported. During the harvest, losses should be monitored to detect and fix the possible errors that may occur during the process. In order to increase the farmers' profitability, losses in quantity and quality need to be minimized (Mion *et al*., 2015).

There are several factors, such as machine design, operation conditions, cotton variety, and the applied husbandry practices, affect the performance of the cotton harvesting machine (Anthony (1991) and El-Sayed *et al* 2008). Baker and Hughes (2008) stated that the rotation of the spindle should be at least 2000 rpm and that the changes in length and shaft diameter of the rotation axes did not significantly affect the amount of waste existing in the samples. The use of cotton pickers has no negative effect on traits such as seed cotton yield, lint yield, ginning outturn, fiber length, fiber fineness, fiber strength, elongation, and yellowness (Sımsek and Ozkan, 2005).

Gencer and Ark (2004) reported that the lint quality of the mechanical picked cotton was not significantly different from those picked by hand. Hamann (2011) indicated that the moisture content was the most prevalent factor, affecting elongation, free fatty acid content, yellowness, micronaire, length, and reflectance. Moisture content was followed by trash content, which was found to be a significant factor for the responses of yellowness, micronaire, and length. The use of spindle type pickers led to short fiber content, which indirectly caused a loss in the fiber strength quality as compared to hand picking (Nikhil Gedam 2014). Abdullah Sessiz and Reşat Esgici (2015) found that there are no differences between cotton lint qualities harvested by hand and cotton pickers. On the other hand, cotton picker model and driver's ability were statistically differed on the harvest losses. The objective of this study is to compare two different types of cotton picker harvesting machines based on picking loss, machine productivity, energy requirements, and produced fiber characteristics.

MATERIALS AND METHODS

Field experiments were conducted at Sakha farm, Egypt (Pass between latitudes 22° and 36' 31° N, and longitudes between 24° and 37°) to evaluate and compare the performance of two cotton pickers that different in cotton bolls separating system (John Deere 9970, model PC 602, four rows), and 2-row tractor mounted cotton picking machine (Pamuk, model ptm2). The John Deere cotton picker contains driving room, cotton picking mechanism (plant lifters, spindles, and spindle bushings), doffers, a water system, an air conveyance system, a basket-base system, and an engine, as shown in Figure 1. On the other hand, the two-row tractor mounted cotton picking machine contains two main components: cotton picking mechanisms (picking heads, basket, hydraulic system, fan system and chassis) and a tractor, as shown in Figure 2. Optionally, any tractor brand is suitable and functional with the cotton-picking machine if its capacity is more than 52 kW. The tractor can be easily mounted/dismounted before/after the harvesting season, thus the tractor can be used for regular operation during the rest of the year. It is worth mentioning that the cotton bolls separating system in the John Deere picker uses spindles, whereas the Pamuk picker uses saw cylinders.

Fig. 1. Photograph of the cotton picker John Deere 9970 (model PC 602).

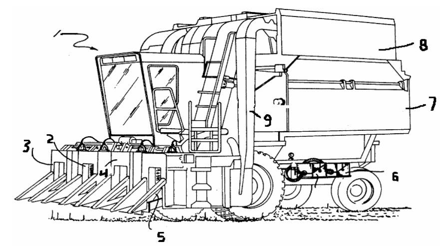

Fig. 2. Sketched view of the cotton picker John Deere 9970 (model PC 602).

1. Driving room 2. Picking unit 3. Inlet crop 4. Control unit 5. Stalk Lifter
6. Hydrolic pump 7. Discharge mat 8. Cotton basket 9. Conveyer

Fig. 3. Photograph of the cotton picker Pamuk (model Ptm2).

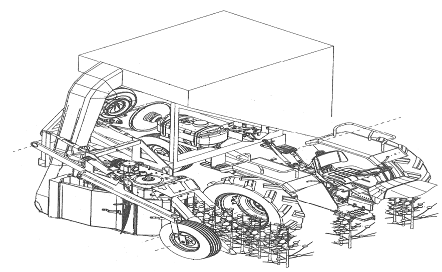

Fig. 4. Cross section view of the operational parts of cotton picker Pamuk.

The specifications of these machines are presented in tables 1. The field soil was mainly clay soil with an average bulk density of 1.216 g.cm^{-3}. The field was prepared using a seven shank two pass chisel plough, a disc harrow, and a LASER leveling with a 0.5 % slop. Giza 86 cotton variety (G. *barbadense* L.) was mechanically sowed by a pneumatic planter, model Gamma 90. The performances of both picking machines were evaluated in terms of picking losses, machine productivity, specific energy requirements, and physical fiber quality properties such as span fiber length, length uniformity %, reflectance %, yellowness, elongation and cotton strength. The cotton pickers were evaluated at four mean forward speeds of 1.32, 1.66, 1.87, and 2.15 km h^{-1}, three fiber moisture contents of 13.3, 10.8, and 8.7%, and three inter- row spaces of 0.70, 0.76, and 0.85 m. Fiber moisture content was determined at the cotton testing laboratory, Sakha Agricultural Research Station. Three other seed cotton samples each of 750 g weight were collected for each experiment and were considered for determining the physical fiber properties.

Table 1. Technical specifications of the John Deere model 7260 and the Pamuk brand cotton harvesting machine model ptm2.

Specifications	Cotton picker machine (John Deere 9970)	PAMUK Ptm2 brand cotton harvesting machine
Model	John Deere 9970	Pamuk Ptm2
Source of manufacture	U S A	turkey
Overall length, cm	600	7.1m
Overall width, cm	380	2.1m
Overall height, cm	450	4.0m
Front tire, inch	20.8×38	
Rear tire, inch	9.0×24	9.0×24
Total weight, Mg	8	3.5
Source of power	Diesel engine- 102.9 kW	Tractor (min. 55kW)
Number of rows	Four	Two
Number of drums in picking unit	Contains two picking drums	Four picking drums
Picking drum-type arrangements	Contains 216 spindles	Brush (polyethylene)
Drum height control	Hydraulic	Hydraulic
Picking style	Vertical	Vertical

Measurements:

Picking losses: The losses represent the cotton formerly dropped from the plants and the cotton that dropped by cotton picker during harvesting operation. The harvesting loss (L, %) was determined by using the following formula:

$$L=\frac{(P+G)}{H}x100,\% \quad \text{--------------------- (1)}$$

Where: P is the mass of the cotton left on the plants in a 3 m length of row (kg), G is the mass of cotton on the ground in a 3 m length of row after mechanical harvesting (kg), and H is the mass of the cotton harvested in a 3 m length of row (kg).

Machine productivity: The machine productivity (Pm) in Mg h-¹ was calculated using the following formula:

$$P_m=\frac{W}{T} \quad \text{---------------------------- (2)}$$

Where: W is the weight of cotton picked by the machine (Mg), and T is the harvesting time (h).

Power requirements and specific energy consumption :

The power consumption (P_c, kW) was calculated using the following equation (Hunt, 1984):

$$P_c=\frac{FC\times\rho_E\times L.C.V\times 427\times\eta_m\times\eta_{thb}}{3600\times 75\times 1.36}, kW \quad \text{--------- (3)}$$

Where: FC is the fuel consumption, l/h; ρE is the density of fuel, kg/l; L.C.V is the lower calorific value of fuel, 10000 kcal/kg; ηthb is the thermal efficiency of the engine(considered to be about 35 for diesel engine).; and ηm is the mechanical efficiency of the engine, 80%.

The specific energy consumption (E) in kW.h Mg-1 was calculated as follows:

$$E=\frac{P_c}{P_m} \quad \text{--- (4)}$$

The produced fiber properties:

The fiber physical properties were determined at Cotton Technology Department, Cotton Research Institute, Agricultural Research Center, Giza. Seed cotton samples were collected from each experiment in plastic bags and isolated to prevent the effects of temperature and humidity. A digital fibrograph (model 630) was used to determine the 2.5 % and 50 % span fiber length. According to May and Bridges (1995), the 2.5 % span fiber length is the length of the fibers in millimeters (mm) where 2.5 % of the fibers are more than or equal to this length, and the 50 % span fiber length is the length of the fibers in mm where 50 % of the fibers are more than or equal to this length. The percentage of uniformity (U) is the ratio between the short and the long fiber lengths, and it was determined by using the following formula:

$$U=\frac{50\%\,span\ fiber\ length}{2.5\%\,span\ fiber\ length}x100,\% \quad \text{---------------- (5)}$$

In addition a high volume instrument (HVI) was used to determine the reflectance, yellowness, and seed cotton trash content according to ASTM, designated D-1445-75, 1984. The elongation and cotton strength was also measured by using a stelometer at the fiber testing laboratory, Cotton Research Institute, Agricultural Research Center. This instrument gives elongation readings and the cotton strength for unit length (SL, g/tex) based on the following formula:

$$SL=\frac{\text{Cutting mass, kg}\times 1.5\times 100}{\text{Mass of sample, mg}} \quad \text{------------- (6)}$$

RESULTS AND DISCUSSION

Picking losses:

Fig. 5 presents the effect of the forward speed, fiber moisture content, and inter-row spacing on the mechanical picking loss. At a fiber moisture content of 10.8 % and an inter-row spacing of 0.85 m, observed that increasing the forward speed from 1.32 to 2.15 km h^{-1} led to an increase in the picking loss from 0.8 to 2.1 and from 4.5 to 5.7 using the John Deere and Pamuk cotton pickers, respectively. This may be attributed to some of the bolls falling on the ground due to an increase of impacts on the cotton plants caused by the increased forward speed. On the other hand, at a high forward speed, the spindles may miss picking some bolls. It can also be seen from Fig. 5 that the minimum loss values were recorded with a fiber moistures content of 10.8 %. Increasing or decreasing the moisture content more or less than 10.8 % caused an increase in the machine loss. At all levels of the other variables, the minimum picking loss was found to be associated with a row space of 0.76 m, and the maximum values were recorded at a row space of 0.7 m. These results are in agreement with those obtained by Oz and Evcim, 2002). For all other variables used in this study, the use of the John Deere picker resulted in a minimum value of cotton loss compared to the use of the Pamuk picker. Oz, 2005 and Simsek and Ozkan, 2005 stated that at proper conditions the stalk loss had a range from 3 % to 5 %. It can be observed that the John Deere picker losses are in the same range. However, the Pamuk picker loss exceeds the above mentioned values.

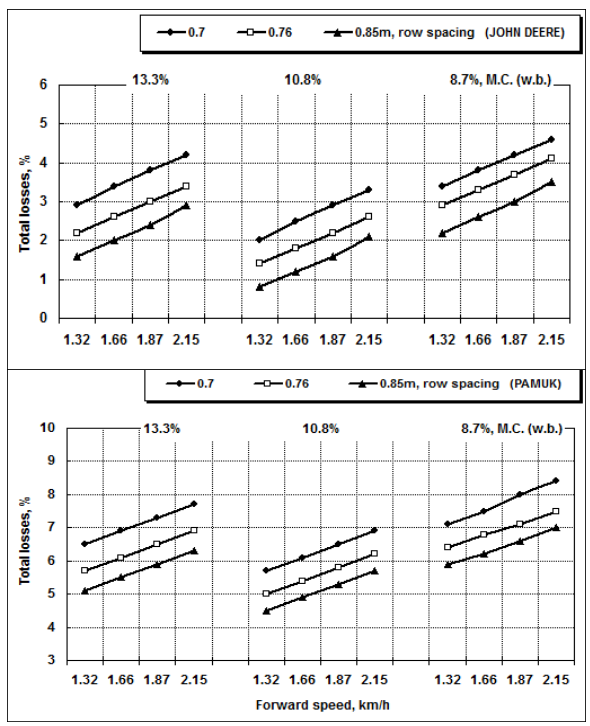

Fig. 5. Effects of forward speed on the total losses at row spacing and fiber moisture content for John Deere and Pamuk machines.

Machine productivity:

Data of cotton picker productivity affected by the machine forward speed, fiber moisture content, and inter-row spacing are presented in Fig. 6. It is clear that increasing the forward speed and decreasing the moisture content increases the machine productivity. Increasing the forward speed from 1.32 to 2.15 km h^{-1} resulted in an increase of the John Deere and the Pamuk productivity from 1.567 to 2.12 and from 0.782 to 0.995 Mg h^{-1}, respectively, with a cotton moisture content of 10.8% and an inter-row spacing of 0.76 m. That may be attributed to the increase in machine capacity because of the increase in the forward speed. The machine productivity was found to be inversely proportional to the fiber moisture content. Increasing the moisture content from 8.7 to 13.3 % decreased the John Deere and Pamuk pickers from 1.487 to 1.432 and from 0.753 to 0.731 Mg h^{-1}, respectively at a forward speed of 1.32 km h^{-1} and an inter-row spacing of 0.76 m. These results may be attributed to the increase in the number of mature bolls as a result of delaying the harvesting. On the other hand, the highest values of machine productivity were associated with the inter-row spacing of 0.76 m compared to the other inter-row spacing. The maximum John Deere and Pamuk cotton picker productivity of 2.041 and 0.995 Mg h^{-1}, respectively, recorded at a forward speed of 2.15 km h^{-1}, a moisture content of 8.7 %, and an inter-row spacing of 0.76 m.

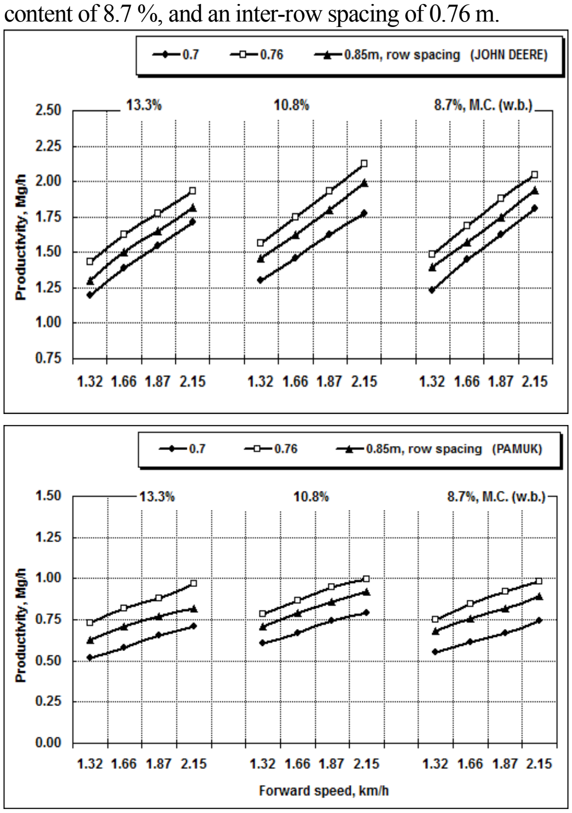

Fig. 6. Effects of forward speed on the productivity at row spacing and fiber moisture content for John Deere and Pamuk machines.

Specific energy consumption

Specific energy is defined as the energy consumed by the machine to pick up 1 Mg of cotton fiber. Fig. 7 illustrates the effect of the forward speed, fiber moisture content, and inter-row space on the specific energy consumption. At all fiber moisture content levels and inter row spaces, the maximum values of the specific energy consumption were associated with a forward speed of 1.32 km h^{-1}. Increasing the forward speed from 1.32 to 2.15 km h^{-1} decreases the specific energy consumption from 35.11 to 30.26 and from 47.12 to 42.29 kWh Mg^{-1} for the John Deere and Pamuk cotton pickers, respectively, at a fiber moisture content of 13.3% and inter-row spacing of 0.70 m. With all other variables considered in this study, the lowest values of specific energy consumption recorded with an inter-row spacing of 0.76 m and fiber moisture content of 8.7 % compared to the other inter-row spaces. The minimum specific energy consumption of 23.07 and 30.69 kWh Mg^{-1} for the John Deere and Pamuk cotton pickers, respectively, occurred when the cotton moisture content was 8.7 %, inter-row spacing was 0.76 m, and forward speed was 2.15 km h^{-1}.these results may attribute to an increase in the machine productivity at using John Deere cotton picker. Generally, It was noted that the Pamuk picker consumed more energy than that of the John deer picker. From the above it is clear that an inter-row spacing of 0.76 m. recorded the highest value of productivity and less value of specific consumption of energy and an acceptable level of cotton loss ratios at all experiment levels so it is recommended to planting at this distance when the desire to harvest mechanically by both of this machines.

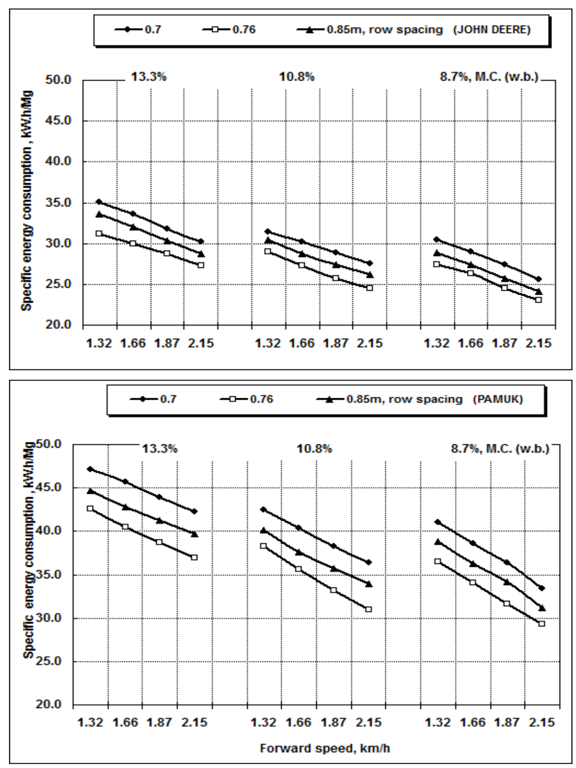

Fig. 7. Effects of forward speed on the specific energy consumption at row spacing and fiber moisture content for John Deere and Pamuk machines.

Effect of the mechanical harvesting process on the fiber physical properties:

The fiber physical properties were measured in an inter-row spacing of 0.76 m. Data of the fiber physical properties as affected by the machine forward speed and fiber moisture content for the John Deere and Pamuk cotton pickers is shown in Table 2. At the given fiber moisture content values for both pickers showed that, increasing the machine forward speed tends to decrease the 2.5% and 50%

span fiber length, fiber length uniformity, fiber reflectance (Rd), fiber strength, fiber elongation, and seed cotton grade. On the contrary, the seed cotton trash content and yellow colorization was increased with an increase in the forward speed. The minimum value of seed cotton trash and yellow colorization were 4.11 and 6.1 units, respectively, recorded with the John deer picker at a forward speed of 1.32 km h-1, fiber moisture content of 13.3 %. It can also be seen from Table 2 that with all other variables, the lowest values of the 2.5 % and 50 % span fiber length, fiber length uniformity, fiber reflectance (Rd), fiber strength, fiber elongation, and seed cotton grade along with the highest values of the seed cotton trash content and yellow colorization were found to be associated with a fiber moister content of 8.7 %. Meanwhile, the highest values of the 2.5 % and 50 % span fiber length, fiber length uniformity, fiber reflectance (Rd), fiber strength, fiber elongation, and seed cotton grade along with the lowest values of the seed cotton trash and yellow colorization recorded at a fiber moisture content of 13.3 %. These results may attribute to an increase in the amount of impurities that enter the cleaning unit due to the dryness of the plant leaves and boll cover with the low moisture content. Similar results were found by El Sayed *et al*, 2008. The John Deere picker resulted in physical fiber properties better than in the case of the Pamuk picker. This may attribute to the nature of picking mechanisms in both pickers. The use of saw cylinders in the Pamuk picking unit causes a deterioration of the fiber properties.

Table 2. Effects of forward speed on the cotton fiber properties at moisture contents and an inter-row spacing of 0.76 m produced from John Deere and Pamuk cotton pickers .

Moisture content, % d.b.	Forward speed, km/h.	Span fiber length, mm. 2.5%	Span fiber length, mm. 50%	Fiber length uniformity %.	Seed cotton trash content, %.	Reflectance (Rd), %.	Yellowness (+b), unit.	Cotton strength, g/tex	Elongation, %
John Deere cotton picker									
13.3	1.32	32.5	17.1	52.61	4.11	72.8	7.1	29.1	6.9
	1.66	32.2	16.6	51.55	4.87	72.4	7.3	29.0	6.5
	1.87	31.7	16.3	51.31	5.28	71.9	7.6	28.8	6.3
	2.15	31.5	15.8	50.16	5.66	71.4	7.9	28.7	5.9
10.8	1.32	31.9	16.7	52.35	4.67	72.3	7.4	28.8	6.5
	1.66	31.5	16.3	51.74	4.99	71.9	7.7	28.5	6.2
	1.87	31.3	15.9	50.79	5.51	71.2	8.0	28.3	5.9
	2.15	30.9	15.5	50.16	5.78	70.7	8.3	28.1	5.6
8.7	1.32	31.6	15.4	48.73	5.32	71.7	7.7	28.3	6.2
	1.66	31.3	15.2	48.56	5.71	71.3	8.1	28.1	5.8
	1.87	31.0	14.9	48.06	5.94	70.9	8.5	28.0	5.4
	2.15	30.7	14.6	47.55	6.28	70.6	8.8	27.8	5.0
Pamuk cotton picker									
13.3	1.32	31.8	16.4	51.57	4.95	71.1	7.6	28.4	7.4
	1.66	31.5	16	50.79	5.36	70.7	7.9	28.2	7.2
	1.87	31.2	15.5	49.68	5.78	70.3	8.3	28.0	6.8
	2.15	30.8	15.1	49.03	6.28	69.8	8.8	27.7	6.4
10.8	1.32	31.5	16	50.79	5.42	70.6	7.9	28.2	7.1
	1.66	31.2	15.6	50.00	5.81	70.2	8.2	27.9	6.9
	1.87	30.9	15.1	48.87	6.36	69.8	8.6	27.6	6.4
	2.15	30.7	14.8	48.21	6.57	69.5	9.1	27.2	6.1
8.7	1.32	31.3	15.5	49.52	5.89	70.3	8.4	27.9	6.8
	1.66	31	15	48.39	6.24	70.0	8.9	27.7	6.3
	1.87	30.7	14.4	46.91	6.63	69.4	9.1	27.3	5.9
	2.15	30.4	14	46.05	7.18	68.9	9.5	26.8	5.5

CONCLUSION

The performances of two cotton harvesters with different picking mechanisms were compared and evaluated while harvesting Egyptian cotton, Giza 86 seed cotton variety. The two machines were the John Deere 9970 cotton picker model PC 602 and the Pamuk Ptm2. Conclusions of the study include the following:

1- An increase in the forward speed within the range of values included in this study was found to increase both productivity and total cotton losses. However, increasing the speed decreased the specific energy requirements at all levels of fiber moisture contents and inter-row spacing for both cotton pickers.

2- The maximum values of productivity and minimum values of specific energy consumption for both cotton pickers were associated with the fiber moisture content of 8.7 % with all other parameters considered in this study. On the other hand, the minimum values of machine losses were recorded with a fiber moisture content of 10.8 %.

3- An inter-row spacing of 0.76 m achieved the highest values of productivity and minimum values of specific energy consumption while an inter-row spacing of 0.85 m achieved minimum machine losses for all the analyzed forward speeds and fiber moisture contents for both the cotton pickers.

4- For all parameters considered in this study, the use of the John Deere cotton harvester resulted in a maximum values of machine productivity, 2.5% & 50% span fiber length, uniformity ratio, color reflectance (Rd), fiber strength, and fiber elongation along with a minimum cotton loss, specific energy requirements, seed cotton trash, and yellow colorization compared to the use of the Pamuk picker.

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تأثير عملية الحصاد الميكانيكي على الإنتاجية و جودة الألياف القطن.

عاطف عزت اليماني ، سامي عبد الجيد مرعى و إسماعيل فؤاد سيد احمد.
معهد بحوث الهندسة الزراعية – مركز البحوث الزراعية – الجيزة – مصر .

تعد عملية الجني اليدوي للقطن الزهر في مصر من أكثر بنود إنتاج محصول القطن تكلفة نظرا لارتفاع أجور العمالة ولاحتياج العملية لعدد كبير من العمالة و ذلك لصعوبة عملية فصل فصوص القطن الناضجة عن نبات القطن حيث أنها تعتمد على الصفات الو راثية للنبات ومسافات الزراعة بين الخطوط والمحتوى الرطوبى للمحصول . لذلك أصبح من الضروري جدا استخدام الجني الميكانيكي لمحصول القطن لتخفيض تكاليف الإنتاج ولكن يعاب على عملية الجني الميكانيكي ارتفاع نسـبة الشوائب بالقطن الناتج وأيضا ارتفاع نسبة فقد القطن بالحقل و قد ظهرت في الآونة الأخيرة أكثر من طراز من آلات جني القطن لدراسة إمكانية استخدامها تحت الظروف المصرية حيث تختلف عن بعضها في أسلوب نزع ألياف القطن الزهر من النبات مثل آلة جون دير أربعة خطوط أمريكية الصنع و آلة باماك اثنين خط تركية الصنع. لذلك فقد أجري هذا البحث بهدف تحديد انسب أسلوب وانسب ظروف لجني المحصول بحيث تعطى إنتاجية مرتفعة ونسبة فقد للمحصول منخفضة مع المحافظة على صفات الجودة للألياف . ولذلك فقد تم دراسة تأثير كل من العوامل التالية: - نوع آلة الجني حيث تم استخدام آلة جون دير أربعة خط أمريكية الصنع و آلة باماك اثنين خط تركية الصنع.- السرعة الأمامية للآلة حيث تم دراسة أربعة سرعات وهي 1.32، 1.66، 1.87، 2.15كم/ساعة.- المحتوى الرطوبى للألياف تم دراسة ثلاثة محتويات رطوبة وهي 13.3، 10.8، 8.7%.- مسافة الزراعة بين الخطوط تم اختبار ثلاث مسافات وكانت 0.7، 0.76، 0.85م. وقد تم دراسة تأثير هذه العوامل على مؤشرات الكفاءة التالية وهي: نسبة الفقد للمحصول - الإنتاجية- الاستهلاك النوعي للطاقة. أيضا تم دراسة تأثير هذه العوامل على بعض صفات الجودة للألياف مثل (طول التيلة عند نسبة توزيع 2.5% ونسبة توزيع 50%- نسبة تماثل الألياف- المحتوى من الشوائب بالقطن الزهر- درجة الانعكاس- درجة الاصفرار- المتانة- الاستطالة -درجة الرتبة للقطن الزهر). و لقد أظهرت النتائج المتحصل عليها ما يلي: 1- أقل نسبة فقد فى المحصول كانت 0,8 , 4,5% لكل من آلة الجني جون دير و آلة الجني باماك على الترتيب و ذلك عند سرعة تقدم 1,32كم/ساعة و محتوى رطوبى للمحصول 10,8% و مسافة بين الخطوط 0,85متر على الترتيب. 2-أعلى إنتاجية كانت 2,1 و 0.995ميجاجرام/ساعة لكل من آلة الجني جون دير و آلة الجني باماك على الترتيب سجلت عند سرعة تقدم 2.15كم/ساعة ومحتوى رطوبى 8.7% ومسافات بين خطوط الزراعة 0.76م على الترتيب. 3-أقل قيمة من الطاقة النوعية اللازمة كانت 23,07 , 30,69 كيلووات/ ميجا جرام لآلة جون دير والآلة باماك على التوالي سجلت عند سرعة تقدم 2.15كم/ساعة ومحتوى رطوبى 8.7% ومسافات بين خطوط الزراعة 0.76م على الترتيب. 4-مسافات الزراعة بين الخطوط 0.76م كانت تناسب الجني بكلتا الآلتين حيث كانت تعطى أعلى إنتاجية بينما مسافات 0.85م تسجل اقل قيم في نسبة الفقد . 5-اعلى رتب القطن تم الحصول عليها أثناء معاملات الجني الميكانيكي باستخدام آلة جون دير 4 خط لذلك تعتبر هذه الآلة الأكثر محافظة على صفات جودة القطن تحت الظروف المصرية. 6-للألياف عند استخدام آلة جون دير 4 خط كانت تدل أن أعلى قيمة لأطوال الألياف عند نسب توزيع 2.5 و50% ونسبة التماثل ودرجة الانعكاس اللون كانت 5.32مم , 17.7مم , 52,61% و 72,8% على الترتيب بينما كانت اقل قيمة لمحتوى الشوائب بالألياف و درجة الاصفرار هي 4,11% و 7,1 وحدة على الترتيب تم الحصول عليها عند سرعة تقدم 1.32كم/ساعة ومحتوى رطوبى 13.3% ومسافات بين خطوط الزراعة 0.85م على الترتيب.لذا يوصى باستخدام آلة جني القطن جون دير عند ظروف التشغيل السابقة وذلك للوصول لأفضل نتائج وصفات جودة للألياف الناتجة.