Rice production under influence of machine type and its clearance

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Abstract:

This study aims to know the impact of the peeling machine type and the clearances on some qualitative characteristics of the Jasmine cultivar rice production. It was observed from this study that the S-KB40 peeling machine was significantly superior to the Y-ST50 peeling machine in all the studied characteristics, while it achieved the highest results with a clearance of 0.9cm, except for the husking efficiency that achieved the highest results with the clearance 0.5 cm. The experiments were conducted in a factorial experiment under CRD with three replications. For S-KB40 the MP, PR, HE and BR were 1.821t.hr-1, 13.912Kw, 75.709 % and 6.291% respectively. For 0.9cm clearance the MP, PR, HE and BR ,were1.902 t.hr-1, 12.763 Kw, 72.935% and 5.854% respectively.

Keywords: Rice, Clearances, peeling machines S-KB40,Y-ST50 , JA cultivar.

1. Introduction

Strategic crops, especially wheat and rice, represent the core of food security in the world. The agricultural sector is the important pillar in human life and food, but since it deals with the most natural conditions, its will must be carried out with an integrated vision of the natural and human production elements during the process of crop activity from the field level to the production level [1,2,3]. Iraq is the only country in the Arab world that relies on its own resources to secure its needs of wheat, rice and corn until 2003 [4,5]. Iraq Ministry of Trade (General Company for Grain Processing) obtained the crop from the farmer, with moisture content lower than 20%. The rest of the crops remained by farmers in the farms for longest period which leads to germination and putrefaction due to leave the crop on the land of field and exposure to rain and percentage of the moisture. The main reason of high damage of the crop is due to the lack of dried stores [6,7].

The rice manufacturing processes depend mainly on the rice variety in terms of the length and grain thickness, so the machine must be chosen in accordance with the rice type to be manufactured, also the rice manufacturing processes are affected by the skill of the operator. Increase in the loss rates represented by an increase in the rice breakage, than the wrong regulation of the machine clearance that is not consistent with the cultivar presented to the manufacturing stages[8,9]. The any crop productivity presented to the manufacturing stages is affected by the machine type and the working speed . The higher the work speed, the heterogeneity with the machine clearance (the relationship between speed and machine clearance) during the manufacturing stages, the higher the loss ratios in crop output [10,11,12] found that the in pieces cereals size which is minimal than a quarter of the extent of the cereal and back are due to sundry factors, inclusive the machine regulation, cereal wet content, throughout the manufacturing stage as well as to the

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mechanical stresses experienced the cereals in the manufacturing stage [13,14].

The rapprochement of husking efficiency factors between experiential results and imitation results showed that the differences in husking efficiency, milling efficiency, milled rice recuperation between experiential and simulation were 0_10%, 0-7%, 0-4%, respectively. Though the mimicry results were a modicum minimize than experimental ones, they are close [15,16]. The materials created in the imitation processes were compared with those in the experiential. [17,18,19]. wet grains content effect and pivot velocity on the rice fraction the factory over husking procedure using a rubber roll husker. It was reported that the reacting impact of pivot velocity and wet grains content safely influenced the husking index but did not impact the rice smashing amount [20,21,22]. The prime object of this study is to examine the impact of husking machines (S-KB40 and Y-ST50) on rice, Jasmine (JA) cultivar at various clearances among cylinders.

2. Material and methods

This study was showed to examine the effectiveness of a two husking machines (S-BK40 and Y-ST50) in 2022. The exams were thorough at three clearance ratio: 0.5, 0.7 and 0.9 mm cylinders. For the experimentations, the cultivar Jasmine (JA) were nominated and the models were takenby the investigation and calm in the form of a heap, the number heaps being nine and per-heap weight being 250 kg according to the system used [23,24]. JA cultivar rice was kept in an oven at a fever of 43° C and prudently monitored to regulate the wet content of grain at 13%-16%, then the models were taken and located in the precisiondivider to obtain a model weight of 300 g and then thesamples were prudentlysealed in polyethylenebags. The Sataketypemachine was adjusted to 0.6 mmclearance betweencylinders and 4.7 m / s linear velocity and then the 300 g models wereplaced in themachine (Figure 1). The sample was then removed from the system and put in a Satake style cylindrical insulating unit with working period set to 2 min. The angle of inclination for per examines was 25° insolating the be divided and whole feed. In the same ways, I repeated on the peeling machine Y-ST 50 (Fig. 2). For each running test it was calculated the machineproductivity (MP), powerrequired (PR) , huskingefficiency (HE) , breakageratio (BR) . [25,26]

2.1.Machine productivity (MP):

The MP was calculated as follow [27,28]..

$$q = \frac{W \times 60}{T \times 1000}$$

Where, q is MP (th^{-1}), W is production, (g), and T is time (min).

2.2.Power required (PR):

. The PR for this research is calculated as [11,29].

$$P_R = \frac{\sqrt{3}}{1000} \cdot v \cdot I \cdot \cos\varphi \cdot E_{FE}$$

Where, P: (kW), $V$is voltage (V) and I :Is the electric current A, and cos (φ) is the angle between the current and voltage while (E_{FE}) is the motor efficiency (85%).

2.3.Husking efficiency :** (HE)

The HE was resolute as [30,31].

(Roy et al.,2003 and Alaamer 2020)

$$H_{E=\frac{W_S - W_{mU}}{W_S} \times 100}$$

Where: E_E: (%)W_{mU}: mass unpeeled rice (g) andW_S mass of rice model used. (g).

2.4.Breakage ratio**: (BR)

The BR was determined as [13,33].

$$B_{R=\frac{W_{br}}{W_s} \times 100}$$

Where: B_R: (%) , W_{br}: weighing of damage grain. (g) and W_s: weighing of rice model

used (g).

Figure 1 The machine (S- KB40 type)

Figure 1 The machine (Y- ST 50 type)

The study results were analysed, according to the used method by [34],using the (CRD) in three replication.

3 Results and discussion

3.1.MP

Table 1 and Figure 3 shown effect of peeling machines (S- KB40 and Y-ST 50) and the clearance between cylinders (0.5, 0.7and 0.9 cm) on the MP, as the highest result was obtained during the peeling phase (2.007 $t.hr^{-1}$) when using the peeling machine S- KB40 and 0.9cm clearance, while the productivity values decreased with the peeling machine Y-ST 50. It was also found that by increasing the clearance, the MP increased, as shown 1.637, 1.766 and 1.902 $t.hr^{-1}$) .The reason for this is a decrease in the temperature inside the peeling chambers with an increase in the clearance, which caused an increase in the machine productivity [5,16] .

3.2.PR

Table 2 and Figure 4 shown effect of peeling machine (S- KB40 and Y-ST 50) were results 13.912and 14.950 Kw respectively. increase clearance between cylinders , gives the lowest result was obtained during the peeling phase (

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12.763 Kw) when the 0.9cm clearance, while the power values increased with the clearance 0.5 and 0.7cm [25],.The reason for this is a decrease in the temperature inside the peeling chambers with an increase in the clearance, which caused an decrease in the power required [11,10]. The interaction among the 0.9 cm clearance and peeling machine S-KB40 provided PR of 12.231Kw.

3.3.HE

The increase in the clearance leads to lowering the HE (78.015%, 75.322% and 72.935%, respectively). The low pressure on the grain in the peeling chamber lowering peeling efficiency with higher clearance of machine. [8,11], (Table 3 and Fig 5). The peeling machine S-KB40 resulted in highest HE (75.709%). The lowest HE of (74.805%) were at husking machine Y-ST 50 . Depends on the peeling machine type and the way it is organized to suit the type of grain provided for makings[21,14],. The interaction among 0.5mm clearance , and peeling machine S-KB40 resulted in maximum HE of (79.207%).

3.4.BR

Table 4 and Figure 6 shown effect of peeling machines (S- KB40 and Y-ST 50) and the clearance between cylinders (0.5, 0.7and 0.9 cm) on the BR, as the highest result was obtained during the peeling phase (5.618%) when using the peeling machine S- KB40 and 0.9cm clearance, while the BR values lowering with the peeling machine Y-ST 50. It was also found that by increasing the clearance, the BR lowering, as shown 7.645, 6.948 and 5.854 % respectively [22],. The reason for this is a decrease in the temperature inside the peeling chambers with an increase in the clearance, which caused an lowering in the rice broken ratio[17,23] .

Table 1. The impact of peeling machine and clearances on MP

Machines	Clearances Cm			Median of machines
	0.5	0.7	0.9	
S-KB40	1.658	1.799	2.007	1.821
Y-ST50	1.616	1.733	1.797	1.715
Median of clearances	1.637	1.766	1.902	
LSD= 0.05	M	0.021		
	C	0.024		
	M*C	0.029		

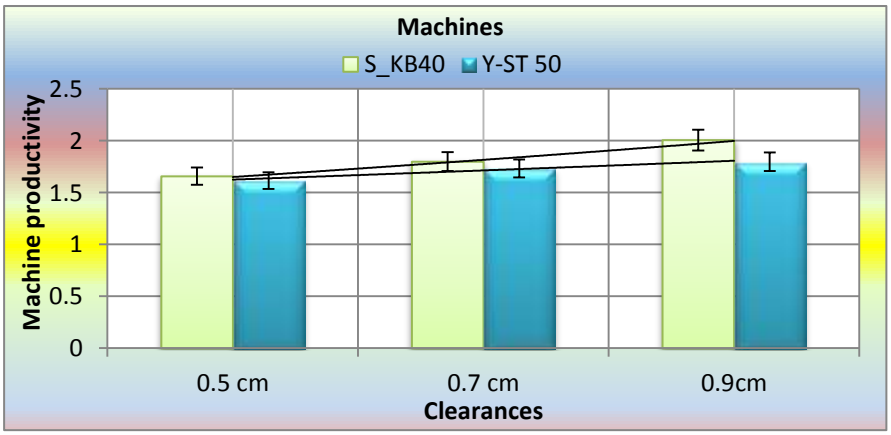

Fig 3. The impact of HM and clearances on MP

Table 2. The impact of peeling machine and clearances on PR

Machines	Clearances Cm			Median of machines
	0.5	0.7	0.9	
S-KB40	15.303	14.204	12.231	13.912
Y-ST50	16.378	15.178	13.295	14.950
Median of clearances	15.841	14.691	12.763	
LSD= 0.05	M	0.213		
	C	0.262		
	M*C	0.303		

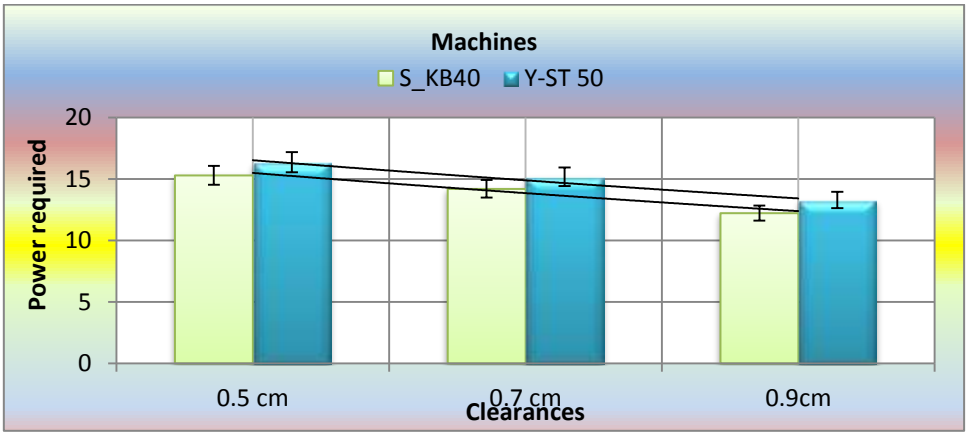

Fig 4. The impact of HM and clearances on PR

Table 3. The impact of peeling machine and clearances on HE

Machines	Clearances Cm			Median of machines
	0.5	0.7	0.9	
S-KB40	79.207	75.687	73.233	75.709
Y-ST50	76.823	74.957	72.637	74.805
Median of clearances	78.015	75.322	72.935	
LSD= 0.05	M	0.301		
	C	0.369		
	M*C	0.426		

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Fig 5. The impact of HM and clearances on HE

Table 4. The impact of peeling machine and clearances on BR

Machines	Clearances Cm			Median of machines
	0.5	0.7	0.9	
S-KB40	7.043	6.211	5.618	6.291
Y-ST50	8.248	7.685	6.091	7.341
Median of clearances	7.615	6.946	5.854	
LSD= 0.05	M	0.150		
	C	0.183		
	M*C	0.212		

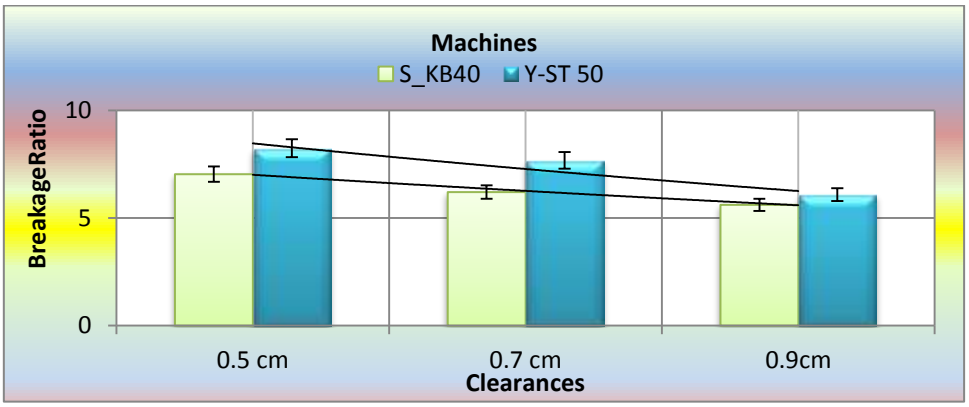

Fig 6. The impact of HM and clearances on BR

4. Conclusions

The 0.9 cm clearance was prime influence than two other 0.7 and 0.5 cm . Also, the S-KB40 peeling machine was superior significantly Y-ST50 peeling machine, in all studied properties. Well results procure to from the overlap among clearance of 0.9cm and the S-KB40, in all studied parameter .

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