STUDYING THE LOSSES OF THRESHING UNIT FOR (JD) COMBINE HARVESTER UNDER THE EFFECT OF DIFFERENT REEL AND THRESHING CYLINDER SPEEDS FOR WHEAT HARVESTING

Saad Yaseen Taha
Lecturer
Dept.of Agri. Machinery & Equipment's Tech. Eng., Al-Mussaib Technical College , Al-Furat Al-Awsat Technical University, 51009 Babylon, Iraq
Saad 2005_ Iraq@yahoo.com

ABSTRACT:

Studying wheat crop losses in the threshing unit for (John Deere) combine harvester under the effect of different speeds of the reel (25 and 35) rpm and threshing cylinder (600 and 700)rpm as well as the effect of changing the number of cylinder raspbars from 10 to 12 bars. The study was conducted in one of agricultural fields of Abu- Graib region in Baghdad,2015. The study showed the effect of these different parameters upon some losses characters such as percentage of clean seeds, percentage of broken seeds, percentage of slim seeds, and the percentage of unthreshed seeds. The experiment was accomplished at moisture condition of 19% for the crop and ground speed of the harvester was 3.6 km/h. The results showed the direct effect of reel speed upon losses percentage of the seeds in threshing unit through the effect of this unit upon percentage of clean seeds which decreases specially at increasing reel speed from (25) to (35) rpm.

The results showed that for increasing cylinder speed there was an important effect upon losses percentage of the seeds as indicated in increasing of broken seeds. Also found that, at increasing of cylinder speed with increasing number of raspbars causes increasing of unthreshed seedspercentage, but increasing reel speed caused decrease the percentage of unthreshed seeds. It seems that increasing number of raspbars caused increasing in broken and slim seeds percentage together with increasing reel speed and cylinder speed.

Key words: Seed losses , Combine harvester ,Threshing cylinder , Harvester reel .

Introduction:

The combine is consider the first harvesting equipment which coming to Iraq. The word harvester means the combine which make a series of operations like gathering, cutting, threshing, cleaning, and packing or unloading. The combine has large mportance in doing theharvesting operations in a short time which means early marketing for seeds.

Management of plant production in FAO , (1993) said that the wheat losses in Iraq may be about 18% to 29% for gathering, cutting and threshing operations, therefore it is important to know that the most important mechanical harvesting problems are the seed breakage or increasing the pressure on it which decrease the seed quality, germination percentage and increase plant failure which causes large economic losses as mention by (AL- Banna, 1998).

Arvinder et. Al, (2001) found that there was a direct effect of seed moisture , speed of threshing

cylinder and feed rate to the threshing unit upon seed breakage and quality which decrease the germination percentage. Cylinder losses should be less than 1% and inversely related to the severity of threshing. However, damage to the grain limits the extent to which severe threshing may be employed (Donnell Hunt, 2008). The suitable operation for the reel causes

decrease the losses of the header to the minimum, While increasing for reel speed causes

increase scattering losses , also the very slow speed of the reel causes fall the cutting heads

out the plateform of the machine. (Ajit K. Srivastava and et. al., 2009). The reel consider as a

first part of the combine which contact with the plant, and the function of it was to support the

plant stems during cutting and lodging them towards feeding mechanism until its falling on the
and collecting by the auger. The reel speed should be about 1.25 – 1.5 times of the plateform
harvester forward speed (AL- Tahhan et. al. ,2000).

Threshing unit has large importance in separating the seed from heads due to the clearance between the cylinder and concave .

The cylinder speed can be changed according to the type, density and moisture of the crop

as well as field condition (Andrei Dumov, 2011). The aims of the research are to study seed

losses for mechanical harvesting when changing the speed of the reel , changing the speed of threshing cylinder and changing the number of the raspbars of the cylinder.

Materials and methods:

This study was conducted in one of a special agricultural fields of Abu- Graib region in Baghdad, 2015.

Factorial experiment according to Randomized Complete Block Design RCBD was used in the

Study. The combine harvester was John Dear C 670 i with operating width for reel 4.3 m ,

cylinder diameter 60 cm , operating width for cylinder 1.56 m and the area of the concave was

1.04 m². Harvesting date was 27/5/2015 . Productivity was calculated from computing the

productivity of the field at area 10 m² manually with three replications for each experimental

unit. The productivity was 6.4 ton/ha. As well as computing plant height 1.2 m , plant density

for the crop 88000/ha and seed moisture 19% , also predicting the preharvest losses by

collecting the seed and heads fallen for 1 m² area with three replications and subtract them from the total loss.

Studying the effect of the following factors was take place in this research :-

1- The speed of the reel which was 25 and 35 rpm.

2- The speed of the threshing cylinder which was 600 and 700 rpm , measured by using Tachometer. The front clearance between cylinder and concave was fixed at 12 mm and the rear clearance at 8mm.

3- The number of raspbars in the threshing cylinder was 10 raspbars and increased to 12 raspbars (after made modifications for the cylinder).

The indicators studied after harvesting the field for a distance of 100 m , then stop the machine

at that place after the seed reached the tank of the combine.

Three samples taken from the seed in the tank and put them in special small bags with special

number on each of these samples , after that the unwanted material like , stones , plant residue

had been separated by hand , then isolate broken seeds , slim seeds , unthreshed heads and the

cleaned free seeds . Weight each of these seed samples by electronic balance to determine the

indicators which must be study.

1- Clean seed percent: This percent had been calculated from the following formula which proposed by AL- Banna (1997):

$$\text{Clean seeds percent \%} = \frac{\text{Weight of clean seeds}}{\text{Weight of seed sample}} \times 100$$

Calculated from the following formula which proposed by AL-Banna 2- Broken seeds percent: (1997) and R. Suresh (2004) :

$$\text{Broken seeds percent \%} = \frac{\text{Weight of broken seeds}}{\text{Weight of seed sample}} \times 100$$

3- Slim seeds percent : Calculated from the following formula which proposed by AL-Qazaz Kamal Muhsen (1990) :

$$\text{Slim seeds percent \%} = \frac{\text{Weight of slim seeds}}{\text{Weight of seed sample}} \times 100$$

4- Unthreshed seeds percent : Calculated from the following formula (after threshing the heads

By hands) which proposed by Ajit K. Srivastava et. al.,(2009) and AL-Banna(1997) :

$$\text{Unthreshed seeds percent \%} = \frac{\text{Weight of unthreshed seeds}}{\text{Weight of seed sample}} \times 100$$

The all steps written above can be repeated after 1- changing in reel speed , 2- threshing cylinder speed 3-the number of raspbars in the cylinder .

Results and discussion:

1-Clean seed percentage, %:-

Table 1 showed that the effect of reel speed , cylinder speed and number of raspbars of the

cylinder upon clean seeds percentage % . The results of the statistical analysis showed that there

was a significant effect of reel speed by using LSD at the 0.05 level , where the superiority reel

speed of 25 rpm upon 35 rpm registered higher clean seeds percent which was 82.89 %

while reel speed of 35 rpm registered lower clean seeds percentage 80.07% .

The table 1 indicated that there was a significant effect of the number of the raspbars of cylinder by using LSD at the 0.05 level , where the superiority number of 10 raspbars upon number of 12 raspbars registered higher clean seeds percent which was 84.11 % while 78.84% for number of 12 raspbars because the increase of the number of raspbars caused to increase the damage of the seeds , also

the results showed superiority cylinder speed 600
rpm in getting higher clean seeds percent 85.095 % because this speed gave more enough time
for threshing the seeds . This results corresponding with the results which proposed by Tavasoli, (2002).
The double interference between reel speed and cylinder speed had a significant effect by using
LSD at the 0.05 level in clean seeds percentage, where reel speed of 25 rpm at cylinder speed of
600 rpm gave higher clean seeds percentage 86.87 % . The lower percentage of clean seeds was at 35 rpm for reel speed and 700 rpm for cylinder speed and this percentage was 76.81 %.
percentage reach to 85. 35 % while reel speed of 35 rpm with 12 raspbars on the cylinder
recorded lower clean seeds percentage 77.25 % because the new design of the threshing cylinder
with 12 raspbars had a great effect upon the threshed seeds for a specific moisture and
condition for the crops , as well as the greatest non-grain material entering the threshing unit at
35 rpm of reel speed. There was a significant effect by using LSD at the 0.05 level of double interaction between cylinder speed and number of raspbars in cylinder in clean seeds percentage where at 600 rpm for cylinder speed with 10 raspbars in the cylinder gave higher percentage of clean seed 87.81% , while 700 rpm for cylinder speed with 12 raspbars gave lower clean seeds percentage 75.29% for the same reasons above . This results corresponding with the results which proposed by Mansoori et. al ,(2003) and Santokh et. al ,(2002) .

The reason for that was the increase in reel speed cause increasing in non- grain material
entering the threshing unit . Also, the increase in cylinder speed causes increase in broken seeds
percentage and this results corresponding with the results which proposed by Shpokes,(2007).
Table 1 also indicated that there was a significant effect by using LSD at the 0.05 level of
double interference between reel speed and the number of cylinder raspbars in clean seeds
percentage where 25 rpm reel speed with 10 raspbars in the cylinder gave higher clean seeds

Table 1 showed the significant effect of triple interference among reel speed , cylinder speed
and number of cylinder raspbars for clean seeds percentage. The interference between 25 rpm
reel speed , 600 rpm cylinder speed and 10 of raspbars superiority for obtaining higher
clean seeds percentage 89.13 % while lower percentage of clean seeds obtained at reel speed 35
rpm , cylinder speed 700 rpm and 12 raspbars was 74.35 % for the same reasons which
discussed above .

Table 1 The effect of reel, cylinder speeds with the number of cylinder raspbars and interaction on clean seeds percentage %

Reel Speed rpm	Cylinder Speed rpm	Interaction Reel , Cylinder speeds with Number of Raspbars in cylinder		Interaction Reel speed and Cylinder speed
		Number of raspbars in cylinder		
		10	12	
25	600	89.13	84.61	86.87
	700	81.57	76.24	78.91
35	600	86.49	80.15	83.32
	700	79.26	74.35	76.81
Number of Raspbars in cylinder mean		84.11	78.84	Reel speed Mean
Reel speed rpm		Interaction Reel speed and Number of Raspbars in cylinder		
25		85.35	80.43	82.89
35		82.88	77.25	80.07
Cylinder speed rpm		Interaction Cylinder speed and Number of Raspbars in cylinder		Cylinder speed Mean
600		87.81	82.38	85.095
700		80.41	75.29	77.855
L.S.D. 0.05 Reel speed: 6.47 Cylinder speed: 7.81 No. of raspbars in cylinder: 7.54 Interaction Reel speed with Cylinder speed: 7.91 Interaction Reel speed with Number of raspbars in cylinder: 6.24 Interaction Cylinder speed with Number of raspbars in cylinder: 8.22 Interaction Reel, Cylinder speeds with Number of raspbars in cylinder: 7.93				

2- Broken seed percentage, % :-

Table 2 shows that a significant effect of reel speed in percentage of broken seeds by using LSD at the level of 0.05 where the superiority reel speed of 25 rpm in obtaining lower broken seeds percentage which was 12.52 % while reel speed of 35 rpm registered higher broken seeds percentage 15.14 % ,because of the higher non-grain material entering the harvester at higher reel speed ,this cause the threshing unit to be throttled and cause to increase the losses percentage. The table also indicated that for changing the number of the raspbars in the cylinder would be significant effect by using LSD at the 0.05 level , it was clear that the number 10 of raspbars registered

lower broken seeds percentage 12.44 % while number 12 of raspbars registered higher value 15.22 % of broken seeds percentage, that means the increase of raspbars number from 10 to 12 cause to increase the losses percentage.

Also table 2 showed that the increase of cylinder speed from 600 to 700 rpm caused increase broken seeds percentage from 10.63 % to 17.03 % , because of increasing the impact on the seeds. This results corresponding with the results which proposed by Arvinder et. al., (2001).

Table 2 indicated that for the double interference between reel speed and cylinder speed was a significant effect by using LSD at the 0.05 level in broken seeds percentage , where reel speed of 25 rpm and cylinder speed of 600 rpm registered lower broken seeds percentage 8.98% while reel speed 35 rpm at cylinder speed 700 rpm registered higher broken seeds percentage 18.00 % because higher reel speed causes increase in feed rate of material and higher cylinder speed causes increase in seeds losses.

The double interference between reel speed and the number of cylinder raspbars had a significant effect by using LSD at the 0.05 level in broken seeds percentage, where the double interference between reel speed of 25 rpm and the number of raspbars of 10 gave lower broken seeds percentage 11.07 % while the double interference between reel speed of 35 rpm and number of raspbars 12 gave higher broken seeds percentage 16.47 % and this because of the direct relationship between reel speed and cylinder speed with seeds losses of threshing unit. The double interference between cylinder speed and number of raspbars in threshing cylinder gave a significant effect by using LSD at the 0.05 level in broken seeds percentage, where lower broken seeds percentage obtained at 600 rpm for cylinder speed and 10 raspbars in the cylinder which was 9.44% while at 700 rpm for cylinder speed with 12 raspbars in the cylinder obtained higher percentage of broken seeds which was 18.62% because of the higher impact upon the seeds at the higher speed for the threshing cylinder. This results corresponding with the results which proposed by Santokh et. al., (2002) .

Table 2 indicated that for the triple interference between reel, cylinder speeds and the number of cylinder raspbars was a significant effect by using LSD at the 0.05 level in broken seeds percentage , where the superiority of the interference between reel speed 25 rpm ,cylinder speed 600 rpm and number of raspbars 10 in obtaining lower broken seeds percentage 7.52 % while higher broken seeds percentage registered at interference between reel speed 35 rpm , cylinder speed 700 rpm and number of raspbars 12 which was 19.75 % for the same reasons above. This results corresponding with the results proposed by Hassani et. al.,(2011) .

Table 2 The effect of reel , cylinder speeds with the number of cylinder raspbars and interaction on broken seeds percentage %

Reel Speed rpm	Cylinder Speed rpm	Interaction Reel , Cylinder speeds with Number of Raspbars in cylinder		Interaction Reel speed and Cylinder speed
		Number of raspbars in cylinder		
		10	12	
25	600	7.52	10.44	8.98
	700	14.61	17.50	16.06
35	600	11.37	13.19	12.28
	700	16.24	19.75	18.00
Number of Raspbars in cylinder mean		12.44	15.22	Reel speed Mean
Reel speed rpm		Interaction Reel speed and Number of Raspbars in cylinder		
25		11.07	13.97	12.52
35		13.81	16.47	15.14
Cylinder speed rpm		Interaction Cylinder speed and Number of Raspbars in cylinder		Cylinder speed Mean
600		9.44	11.81	10.63
700		15.42	18.62	17.03
L.S.D. 0.05 Reel speed: 0.16 Cylinder speed: 0.25 Number of raspbars in cylinder: 0.22 Interaction Reel speed with Cylinder speed: 0.19 Interaction Reel speed with Number of raspbars in cylinder: 0.15 Interaction Cylinder speed with Number of raspbars in cylinder: 0.31 Interaction Reel, Cylinder speeds with Number of raspbars in cylinder: 0.27				

3- Slim seeds percentage , % :-

Table 3 indicated that for the reel speed, a significant effect at 0.05 level in slim seeds percentage , where the superiority reel speed of 25 rpm registered lower percentage for slim seeds which was 0.62 % while reel speed of 35 rpm registered higher percentage for slim seeds was 0.85 % ,that because of higher material (grain + non-grain) entering the harvester at 35 rpm of reel speed . Also table 3 indicated that there was a significant effect at 0.05 level for the number of cylinder raspbars in slim seeds percentage , where the superiority number 10 of raspbars registered lower slim seeds percentage 0.60 % while higher slim seeds

percentage was at 12 raspbars which was 0.86 % . There was a significant effect at 0.05 level for cylinder speed in slim seeds percentage, where the cylinder speed of 600 rpm registered lower slim seeds percentage 0.535 % while 700 rpm registered higher slim seeds percent 0.93 % because the

increase in cylinder speed causes increase passing material quantity which consist of broken and slim grains .

The double interference between reel and cylinder speeds shows a significant effect of 0.05 level

in slim seeds percentage , where 25 rpm for reel speed with 600 rpm for cylinder speed

registered lower percentage of slim seeds which was 0.45 % ,while 35 rpm for reel speed with

700 rpm for cylinder speed registered higher slim seeds percent which was 1.07 % because

of the same reasons explained above . Table 3 shows that for the double interference

between reel speed and number of cylinder raspbars , there was a significant effect of 0,05 level

in slim seeds percentage . Reel speed of 25 rpm with 10 raspbars gave lower percentage of slim

seeds which was 0.5 % while reel speed of 35 rpm with 12 raspbars gave higher percentage

of slim seeds which was 1.26 % . Table 3 showed that the double interference between cylinder speed and the numbars of raspbars in the cylinder gave a significant effect by using LSD at the 0.05 level in slim seeds percentage , at 600 rpm for cylinder speed with 10 raspbars in the cylinder registered lower percentage of slim seeds which was 0.45% while higher percentage of slim seeds registered at 700 rpm for cylinder speed with 12 raspbars in the cylinder which was 1.11%. This results corresponding with the results which proposed by AL-Banna Aziz Rammo, (1997).

The triple interference from table 3 between reel speed, cylinder speed and number of

raspbars in threshing cylinder indicated the significant effect in 0.05 level for slim seeds percentage, where the superiority of the interference between reel speed of 25 rpm and cylinder speed of 600 rpm with 10 raspbars gave lower percentage of slim seeds which was 0.38 % while reel speed of 35 rpm and cylinder speed of 700 rpm with 12 raspbars registered higher

percentage of slim seeds was 1.26 % because the high speed of the reel caused to increase the

material quantity entering the harvester which included slim seeds and the higher cylinder

speed with higher number of raspbars caused to increase the slim seeds quantity passing

together with broken seeds , therefore it's percentage increased . This results corresponding with the results proposed by Quick, (2003).

Table 3 The effect of reel , cylinder speeds with the number of cylinder raspbars and interaction on slim seeds percentage %

Reel Speed rpm	Cylinder Speed rpm	Interaction Reel , Cylinder speeds with Number of Raspbars in cylinder		Interaction Reel speed and Cylinder speed
		Number of raspbars in cylinder		
		10	12	
25	600	0.38	0.52	0.45
	700	0.61	0.97	0.79
35	600	0.53	0.71	0.62
	700	0.87	1.26	1.07
Number of Raspbars in cylinder mean		0.60	0.86	Reel speed Mean
Reel speed rpm		Interaction Reel speed and Number of Raspbars in cylinder		
25		0.50	0.75	0.62
35		0.70	1.26	0.85
Cylinder speed rpm		Interaction Cylinder speed and Number of Raspbars in cylinder		Cylinder speed Mean
600		0.45	0.61	0.535
700		0.74	1.11	0.93

L.S.D. 0.05
Reel speed: 0.011 Cylinder speed: 0.031 No. of raspbars in cylinder:0.027
Interaction Reel speed with Cylinder speed: 0.024
Interaction Reel speed with Number of raspbars in cylinder: 0.01
Interaction Cylinder speed with Number of raspbars in cylinder: 0.03
Interaction Reel, Cylinder speeds with Number of raspbars in cylinder: 0.02

4- Unthreshed seeds percentage, % :-

Table 4 showed that for the reel speed there was not a significant effect at 0.05 level in percentage of unthreshed seeds , but for the number of raspbars in threshing cylinder , there was a significant effect at 0.05 level in percentage of unthreshed seeds, where the superiority of 10 rasp bars in threshing cylinder upon 12 raspbars in recording lower percentage of unthreshed seeds which was 2.86 % while number of 12 raspbars registered higher percentage of unthreshed seeds which was 5.08 % because the increase of raspbars number in the cylinder

causes increasing the quantity of unthreshed heads passing with the material specially at
increasing the cylinder speed from 600 to 700 rpm where the percentage of unthreshed seeds
increases from 3.74 % to 4.195 % respectively , because the high speed of the cylinder

cause to increase the impact on the seeds greater than the time necessary for the threshing . This results corresponding with the results which proposed by Shpokas et. al, (2007).

Table 4 shows that for the double interference between reel speed and cylinder speed was a
significant effect at 0.05 level in unthreshed seeds percentage , where the superiority of 25 rpm
for reel speed and 600 rpm for cylinder speed registered lower percentage of unthreshed seeds,
Which was 3.70 % while reel speed of 25 rpm and cylinder speed of 700 rpm registered
higher percentage of unthreshed seeds which was 4.25 %, because lower cylinder speed gave
threshing enough time for the heads and a suitable number of impacts necessary for threshing
but the excessive cylinder speed causes greater broken seeds percentage and passing more material including more percentage of unthreshed seeds and this results corresponding with the results proposed by Rani, (2001).

For the double interference between reel speed and the number of cylinder raspbars, the table 4 shows that there was a significant effect at 0.05 level in percentage of unthreshed seeds , where
the superiority of the interference between 35 rpm of reel speed with number of 10 raspbars
in recording lower percentage of unthreshed seeds which was 2.62 % while higher percentage for these seeds was at 35 rpm of reel speed and number 12 of raspbars which was 5. 30 % and
the reason in that due to the greater percentage of unthreshed seeds passing with the greater
percentage of broken seeds at higher number of raspbars as well as to the greater material
entering the machine specially entering the threshing unit. The double interference between cylinder speed and the number of the raspbars in the cylinder gave a significant effect by using LSD at the 0,05 level in unthreshed seeds percentage , where cylinder speed at 600 rpm with 10 raspbars in the cylinder registered lower unthreshed seeds percentage 2.29% while higher percentage of unthreshed seeds registered at 600 rpm for threshing cylinder with 12 raspbars which was 5.19%, this results corresponding with the results proposed by Quick, (2003). The triple interference from table 4 indicated that at reel speed of 35 rpm, cylinder speed of 600 rpm and 10 raspbars, registered lower percentage of unthreshed seeds which was 1.61 % while higher percentage was 5.95 % at 35 rpm of reel speed , 600 rpm of cylinder speed and 12 raspbars, that means in this interference, the number of raspbars was the limit factor in effecting upon unthreshed seeds percentage as shown in the table 4.

Table 4 The effect of reel , cylinder speeds with the number of cylinder raspbars and interaction on unthreshed seeds percentage %

Reel Speed rpm	Cylinder Speed rpm	Interaction Reel , Cylinder speeds with Number of Raspbars in cylinder		Interaction Reel speed and Cylinder speed
		Number of raspbars in cylinder		
		10	12	
25	600	2.97	4.43	3.70
	700	3.21	5.29	4.25
35	600	1.61	5.95	3.78
	700	3.63	4.64	4.14
Number of Raspbars in cylinder mean		2.86	5.08	Reel speed Mean
Reel speed rpm		Interaction Reel speed and Number of Raspbars in cylinder		
25		3.09	4.86	3.98
35		2.62	5.30	3.96
Cylinder speed rpm		Interaction Cylinder speed and Number of Raspbars in cylinder		Cylinder speed Mean
600		2.29	5.19	3.74
700		3.42	4.96	4.195

L.S.D. 0.05
Reel speed: N.S. Cylinder speed: 0.083 No. of raspbars in cylinder:0.074
Interaction Reel speed with Cylinder speed: 0.076
Interaction Reel speed with Number of raspbars in cylinder: 0.063
Interaction Cylinder speed with Number of raspbars in cylinder: 0.08
Interaction Reel, Cylinder speeds with Number of raspbars in cylinder: 0.08

Conclusions:-

1- 25rpm of reel speed , 600 rpm of cylinder speed and 10 raspbars for the cylinder treatments got higher clean seeds percent 89.13%, lower broken seeds percentage 7.52% and lower slim seeds percentage 0.38% , and 35 rpm of reel speed 700 rpm of cylinder speed and 12 raspbars for the cylinder treatments got lower clean seeds percentage 74.35%, higher broken seeds percentage 19.75% and higher slim seeds percent 1.26% .

2- The limit or main factor effecting upon unthreshed seeds percent in triple interference was the number of raspbars in the cylinder, where lower percentage of unthreshed seeds was 1.61% at 35rpm of reel speed , 600 rpm of cylinder speed and 10 raspbars, while higher percentage was 5.95% at 35 rpm of reel speed, 600 rpm of cylinder speed and 12 raspbars for the cylinder.

References:

1- Ajit K. Srivastava , Carroll E. Goering , Roger P. Rohrbach, (2009). Engineering principles of agricultural machines . Michigan university USA.

2- AL-Banna Aziz Rammo, (1998). Harvesting equipment's. Dar Al-kutub management for printing and publishing, Mosul university, Ministry of higher education and scientific researches. Iraq.

3- AL-Banna Aziz Rammo, (1997). Seed losses (Wheat and Barley) under harvesting conditions in rainfall rayon. Iraqi agricultural Journal , volume 2 . number 2 . p. 10-13.

4- AL-Qazaz Kamal Muhsen, (1990). The effect of harvester speed upon losses percentage at mechanical harvesting . Iraqi Journal for Agri. Science .Volume 21.

5- AL- Sahooki Midhat, Karrema Mohammed Wahayeb, (1990). Applications in design and analysis of experiments . Dar AL-Hikma for printing and publishing , Baghdad unv. Ministry of higher education and scientific researches .Iraq Res.

6- AL- Tahhan Yaseen Hashim, (2000). Agricultural machines and equipment. Iraq.

7- Andrei Dumov and Aleksandr Kluchov, (2011). Grains combines . Palesse G 812 "12 U KZC-10K" page 152 .

8- Arvinder S. I.K. Garg, V.K. Sharma and A. Singh,(2001). Effect of different crops and operational parameters of a combine on grain damage during paddy harvesting. J. Res. Punjab Agric. University, 38: 241-52 .

9- Donnell Hunt, (2008). Farm power and Machinery Management. Tenth Edition ,Waveland Press. Inc.USA. p. 155.

10- Hassani, H.S. and A. Jafari, (2011). Investigation on Grain Losses of the JD 1165 Combine harvester equipped with variable pulley and belt for forward travel , American Journal of Food Technology 6 (4): 314-312.

11-Mansoori H.and S. Minaee,(2003). Effect of machine parameters on wheat losses of combine harvester , pp:92-4. First National Symposium on losses agricultural product, Tehran: Iran.

12- Pishgar,S.H.,and A.Jafari, (2012). Predicting the relationship between grain-combine travel, cylinder speed and harvesting losses by applying artificial neural networks. Int. Journal of Applied sciences and Engineering research, Vol. 1, No. 3.

13- Quick, G. R. (2003). Combine sweet spot: integrating harvested yield, grain damage and losses . Proceeding of the International Conference on Crop Harvesting and Processing, American society of Agriculture and Biological Engineers, Louisville, Kentucky USA.

14- Rani, M., N.K. Banal, B.S. Dahiya and R.K. Kashyap, (2001). Optimization of machine-crop parameters to thresh seed crop of chickpea. International Agricultural Engineering Journal, 10(3&4):151-164.

15- R. Suresh and Sanjay Kumar, (2004). Objectives & Solved problems in farm power and machinery engineering , Delhi.

16- Santokh, S. , H.S. Sidhu, S.S. Ahuja and S. Singh, (2002). Grain losses in combine harvesting of paddy. J. Res. Punjab Agric. University , 39: 395-8.

17- Sumner, P.E., and Williams E.J., (2009). Measuring field losses from grain combines . The university of Georgia cooperative Extention, B 973.

18- Shpokas, L.,(2007). Research of grain damage caused by high- performance combine harvester. In: Motorization and power industry in agriculture. Lublin, 9, pp. 168-177 (in Russian).

19- Tavasoli, A.,(2002). Investigation on the effect of speed and reel type index of combine on losses while reaping wheat through design and developing reel speed control mechanism. M. Sc.Thesis, Tarbiat Modares University , Iran.

دراسة ضائعات وحدة الدراس في الحاصدة المركبة جون دير تحت تأثير سرع مختلفة لمضرب الضم وأسطوانة الدراس لحصاد الحنطة

سعد ياسين طه

مدرس

قسم تقنيات هندسة المكائن والمعدات الزراعية – الكلية التقنية / المسيب , جامعة الفرات الأوسط التقنية - 51009 بابل- العراق

Saad2005_iraq@yahoo.com

الخلاصة

تم دراسة الضائعات الحاصلة في وحدة الدراس للحاصدة المركبة جون دير تحت تأثير سرع مختلفة لمضرب الضم وهي 25 و 35 دورة/ دقيقة وسرع مختلفة لأسطوانة الدراس وهي 600 و700 دورة/ دقيقة بالأضافة الى تأثير التغير في عدد القضبان المبردية لأسطوانة الدراس من 10 الى 12 قضيب . الدراسة أجريت في مزرعة خاصة في منطقة أبي غريب /بغداد في سنة 2015. بينت الدراسة تأثير مختلف هذه العوامل على بعض خصائص الضائعات مثل, نسبة الحبوب النظيفة, نسبة الحبوب المتكسرة, نسبة الحبوب الضامرة ونسبة الحبوب غير المدروسة . تم تنفيذ التجربة عند رطوبة 19% للمحصول وسرعة أرضية للحاصدة بلغت 3.6 كم/ساعة. بينت النتائج ان لسرعة مضرب الضم تأثيرا مباشرا على نسبة الضائعات الحاصلة في وحدة الدراس من خلال تأثير هذه الوحدة على نسبة الحبوب النظيفة التي يمكن ان تقل خاصة عند زيادة سرعة المضرب من 25 الى 35 دورة/ دقيقة . بينت النتائج ان لزيادة سرعة اسطوانة الدراس تأثير مهم على نسبة ضائعات الحبوب كما هو مبين في زيادة الحبوب المتكسرة , وجد أيضا عند زيادة سرعة اسطوانة الدراس مع زيادة عدد القضبان المبردية تسبب زيادة نسبة الحبوب غير المدروسة, لكن زيادة سرعة المضرب سببت انخفاض في نسبة الحبوب الغير مدروسة. وجد بأن زيادة عدد القضبان المبردية تسبب زيادة في نسب الحبوب المتكسرة والضامرة معا مع الزيادة في سرعتي مضرب الضم وأسطوانة الدراس .

كلمات مفتاحية : ضائعات الحبوب , الحاصدة المركبة, اسطوانة الدراس(التفريط), مضرب الضم للحاصدة