The Effect of Two Types of machines (hulling and bleaching) on some qualitative Characteristics of rice cv.TarmHashemi .

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Abstract:

In the present experiment has been conducted to evaluate effect two types hulling and bleaching machines on some qualitative characteristics of the cultivar TH, in the laboratories of the Tehran University season in 2015. This research has used two types of machines Satake and Yanmar, under three levels of moisture content of grain 10-12%, 12-14% and 14-16%, and three levels of clearance between cylinders 0.4, 0.6 and 0.8 mm. The results indicate that the machine type Satake is significantly better than the machine type Yanmar in all studies traits for both stage two hulling and bleaching. As well as moisture content of grain 10-12% was superior significantly on two levels 12-14%,14-16% in all studied traits for both stage two hulling and bleaching. While clearance o.8 significant superior on two levels 0.4,0.6 mm in all studied traits for both stage hulling and bleaching . The overlap between the machine type Satake and grain moisture content 10-12% superior significantly and also the overlap between the machine type Satake to clearance 0.8. in all studied traits for both stage two hulling and bleaching, as compared with the overlap of the machine type Yanmar with moisture content of grain and of clearance in all studied traits for both stage two hulling and bleaching. The best results have come from the triple overlap among machine type Satake, grain moisture 10-12%, and clearance 0.8 mm in all studied traits, for both stage two hulling and bleaching.

Keywords: Stage Hulling of Rice ,Proportion of Cracked Grain, Percentage of Breakage Rice, Percentage of Whole Grain, Stage Bleaching of Rice ,Proportion of Cracked Grain, Percentage of Breakage Grain, Percentage of Whole Grain, Proportion of Total Extraction.

1. Introduction:

Rice is an essential food in the diet of one third of the world's population . Rice production and consumption is concentrated in Asia where more than 90% of the world's rice is grown and consumed. The 155 million hectares planted throughout the world produce about 596.5 million metric tons of paddy rice per year ."USDA (2006)".Reported that the optimum harvest moisture content for the paddy, and concluded that the paddy moisture content has a significant effect on milling vields of long-grain rice. Also it was concluded that for each one percent decrease in rice moisture content, head yields and total yields increased. It was has found that rice breakage at milling was mostly due to mechanical stresses rather than thermal stresses. "Lee (2015)".Reported that brown rice with 15 and

17% moisture contents has relatively higher values for all quality tests as compared to those of the other rice samples with the exception of cracked brown rice ratio. The cracked brown rice ratio increased with the increase in moisture content (p < 0.05), whereas hardness of the brown rice decreased with the increase in moisture content (p <0.05). These results suggest that paddy rice with 15-17% moisture content produce high quality brown rice."Jia et al.,(2005)". The principal constituent of brown rice is the starch, whose properties are higher hardness and brittleness of brown rice with low moisture content, which is easy to appear the crack and broken rice during the rice milled. Moreover, the rice with a low glabrous degree, as the similar reason, also causes the energy consumption increasing. "Bai et al.,(2005)". They worked on the effect of moisture conditioned for brown rice on milling characteristic is advantageous to enhance the processing technical level of rice and improve the taste quality of rice. Yamashita has carried out researches about the moisture diffusing rule of moisture conditioned and the relationship of taste."Shoughy,(2008)" .Concluded that the brown rice whose moisture content was 12.5% is used as raw material. The brown rice was grouped, then moisturized differently and milled. While milling, the energy consumption, the rate of broken rice and the crack rate are tested. It is confirmed that the stress crack owing to the moisture added to the brown rice can be avoided when the moisture amount added once is limited to no more than 1.5%. It is also proved that the energy consumption can be reduced, the yielding rate of rice can be increased and the quality of rice can be improved. "Alizadeh et al.,(2009)" .Concluded that cracking is the main reason for the break grain rice during crunches and cracking process produces grain rice due to moisture absorption during the harvest time, and mechanical damage in the harvester. " Al sharifi et al(2007)".Mmentioned that the reason that leads to cracking of the grain is mechanical damage to grain during mechanical harvesting process is due to the lack of pay harvester during the harvest process."Saudi,(2008)".Has found that breakage percentage of Furat1 was 14.06% whereas; Jasmine was 11.46% when processing rice. The objective is to evaluate the performance of hulling machine by used three different speeds for rubber rolls on technical properties for two rice cultivars (furat and jasmine)."Correa et al, (2000)". They also have found that long kernels rice are more susceptible to breakage than the shorter ones during the milling process reported that rice breakage is mostly due to mechanical stress. "Nan,(2004)".Has reported that the physical characteristics of rice significantly affected by milling process. Although many factors affecting rice breakage have already been studied, however no reports are found about the effect of paddy husking percentage on the rice milling quality. Therefore, husk ratio in rubber rolls husker on the rice breakage and whiteness determine the appropriate husking percentage for different varieties in order to achieve minimum rice breakage in a commercial milling system." Al sharifi et al .,(2010)". Have showed that broken grain size which was less than a quarter of the length of the pill and back were due to several factors, including the organization of machine and moisture grain during the manufacturing stage in addition to the mechanical stresses experienced by the harvest in the pre-manufacturing grain stage."Williaams et al.,(2002)".Have study the of clearance between the cylinders effect which has a significant effect on precentage of breakage and concluded that the excess of clearance proportion gives less break unlike little clearance is due to an increase in the mechanical effort, which involved a rice grain during the milling.

2. The Objective of the Study;

A study of the effect moisture content and clearance between cylinders for two machines (Satake and Yammer) on some qualitative characteristics of the husking which included cracked grain percentage, breakage percentage, percentage of whole grain, and some qualitative characteristics of the whitening are, proportion of cracked grain, percentage of breakage , percentage of whole grain, proportion of total extraction for cultivar rice **TH**.

3. Materials and methods

The present experiment has been carried out in the laboratory of Tehran University in season 2014-2015 using two types hulling and bleaching machines Satak and Yanmar., The main factors were under three levels of moisture content of grain 10-12%, 12-14% and14-16%. The secondary factors were three levels of clearance between the cylinders peel o.4, 0.6 and 0.8 mm. The experience is on two axis :

3.1.The first axis included hulling machines of rice grain ,Tarm Hashemi cultivar .As show in fig A,B,C.

Random samples were taken from paddy grain cultivar (**TH**) by probe and collected on a form of heaps and the number of heaps were six.Each heap weights 160kg, according to the method used by (Alsharifi et al.,2009).Paddy was cleaned to remove all exotic matters, broken and immature grains using seives.Then the random samples were taken from per heaps weight 1000gm .The initial moisture content of paddy grain was determined by the methods of drying oven at 103c for 48hrs according to method used by (Sacilik et al.,2003). To obtain the desired moisture content level paddy was kept in an oven at temperature of 43c and monitored carefully for TH cultivar . when determining moisture content of grain 14-16% then sample was taken and placed in Precision divider to get a sample of weight 200g ,then the samples were carefully sealed in polythene bags. Then organization of the machine of the type Satake of clearance between cylinders 0.8mm and speed 4.7m\sec. This sample which weight 200g was placed in the machine of the type satake to remove peel from paddy grain . After taking the sample out of the machine and placed in cylindrical insulation device of satake type operating time was 2 minutes and the angle of inclination was 25 degree isolate the broken and full of grain of all size.The following indicators were calculated:



Fig.A- The machine (type Satake) which is used for hulling paddy



Fig.B- The machine (type Yanmar) which is used for hulling paddy



Fig.C- Illustrates the hulling process for two machines(Satake and Yanmar)

3.1.1. Proportion Cracked Grain :

Overexposure of mature paddy to fluctuating temperature and moisture conditions leads to development of fissures and cracks in individual kernel. Cracks in the kernel were the most important factor contributing to rice breakage during milling. This results were reduces milled rice recovery and head rice yields. Eq1 (Ali et al.,2006)

$$P_{Cg = \frac{W_{Cg}}{W_S} \times 100}$$
(1)
Where:

 P_{Cg} -Is proportion cracked grain %

 W_{Cg} -Is weight cracked grain g.

 W_S -Is weight sample the original g.

3.1.2. Proportion of Breakage Rice :

Is the process of separating the broken grain from the whole grains. Compute the percentage of the head rice and broken rice is by using Eq 2: (Gbabo et al.,2014)

$$P_{Br=\frac{W_{br}}{W_s} \times 100}$$
(2)

 P_{Br} -Is the proportion of breakage rice %. W_{br} -Is the weight of breakage grain . g W_s -is the weight of rice sample used g. **3.1.3**. Percentage of Whole Grain :

It represents the amount of whole grains resulting from the crunching process and is free of broken grains .Eq 3 (Alsharifi et al .,2009)

$$P_{Fg=\frac{W_{Fg}}{W_s}\times 100}$$
(3)

Where:

 P_{Fg} - Is the proportion of whole grain .%

 W_{Fq} -Is weight whole grain g.

 W_S -Is weight of rice sample used. g.

Then repeating of the same method and measurements of the previous ones using of the machine type Satake ,moisture content of grain 10-12 ,12-14% and clearances 0.6,0.4 mm and three replications of paddy cultivar (**TH**).Then repeating the same work steps and all accounts using of the machine type Yammer .Each moisture content of grain and each clearance .and three replications of paddy cultivar **TH**.

3.2.The second axis included bleaching machines to paddy Tarm Hashemi cultivra :

After of hulling stage(husk remove) random samples were taken and using organization bleach of the machine of the type Satake of with speed 4.7m\sec for clearance 0.8mm moisture content of grain 14-16% .Then place sample in the room of bleaching machine for 2 minute and by three replications of TH cultivar. After the bleaching process a sample is taken having the weight of 200g from bleaching rice and then place the sample in the cylindecal insulation of type satak paddy, grader and adjust the operating time for 2 minutes and inclination angle was 25 degrees for the purpose of isolating the grain and broken grain for various sizes. The following indicators are calculated:



Fig.D- The machine (type Satake) which is used for whitening paddy



Fig. E- The machine (type Yanmar) which is used for whitening paddy



Fig.C- Illustrates the whitening process for two machines(Satake and Yanmar)

3.2.1. Proportion of Cracked Grain

The proportion of cracked grains in the bleaching process because of the high temperatures during the bleaching process and directly affected the grain, which leads to cracking.Eq: 4 (Andrews et al.,1993)

(4)

$$P_{Cg = \frac{W_{Cgbr}}{W_{SP}} \times 100}$$

Where:

 $P_{C,g}$ -Is proportion cracked grain %

 W_{Cgbr} -Is weight cracked grain from bleach rice g.

 W_S -Is weight sample the original g.

3.2.2. Breakage Proportion:

It is broken grain rate after the bleaching process. Eq: 5(Chaitep,1998)

$$P_{Br=\frac{W_{Br}}{W_s} \times 100} \tag{5}$$

Where:

 P_{Br} -Is the proportion of breakage rice %. W_{Br} -Is the weight of breakage grain from bleach rice . g

 W_s -is the weight of rice sample used g. **3.2.3**. Percentage of Total Extraction:

Is the proportion of bleached rice resulting from bleaching process. Eq :6 (Chaitep et al 2008).

(6)
$$P_{TE=\frac{W_{br}}{Ws} \times 100}$$

Where:

 P_{TE} -Is the percentage of total extraction %. W_{br} - Is the weight of bleaching rice g. W_s -Is the weight of rice sample used . g. **3.2.4.** Proportion of whole Grain :

It represents the amount of whole grains resulting from the bleaching process and is free of broken grains . Eq: 7 (Lower et al., 2003).

 $P_{Fg=\frac{W_{Fg}}{W_s} \times 100}$ Where:

 P_{Fg} - Is the proportion of whole grain from bleach rice % .

 W_{Fg} -Is weight whole grain g.

 W_S -Is weight of rice sample used. g.

Then repeating of the same method and measurements of the previous using of the machine type Satake ,moisture content of grain 10-12%, 12-14 % and clearances 0.6,0.4 mm of the three replications of paddy cultivar (TH). Then repeating the same work steps and all accounts using of the machine type Yammer of each moisture content of grain and each clearance of the three replications of paddy cultivar TH . Results were analyzed statistically using the design C R D and tested the difference among treatments for each factor according to the test LSD less significant difference 0.05.(Alsahoeke et al., 1990).

Results and Disussion:

1- Stage Of Hulling Rice;

1.1.Percentage of cracked grain:

Figure 1 shows the influence of the type of machine, clearance and grain moistuer in the percentage of cracked grain. The results indicated that the machine type Satake is significantly better than the machine type Yanmar by a decreased of (8.8)%. This is due to the efficiency and engineering design of the machine and finishing of the works with less time as compared to the machine type

Yanmar. These findings are consistent with the findings of (Alsharifi et al., 2007). Increasing the clearance between cylinders leads to a significant, extrusive increase , if excelled 0.8 on 0.6 and 0.4 mm by a decrease of (16.9 and 25.1)%. respectively. Because the low pressure on the grain in the peeling chamber with increased clearance between cylinders. These results are consistent with the results that gained by (Lee,2015). But when increasing grain moisture leads to a significant extrusive of increase ,excelled the percentage moisture content of grain 10-12% it leads to a significant decrease by a decrease of (30.6 and 3.3)% respectively as compared with the grain moisture 12-14% and 14-16%. This is due to the fragility of the rice grains and increasing the pressure ,this leads to increase the percentage of cracked grain with decrease grain moisture . This is consistent with (USDA 2006). The overlap between the machine type and grain moisture is significantly .The lowest percentage of cracked grain is when the overlap between the type machine Satake and the grain moisture 10-12% as comparing with the machine type Yanmar to the grain moisture 14-16% by a decrease of (47.6)%. In addition, the overlap between the machine type clearance is significant too because it is significantly better when the overlap between the machine type Satake and the clearance is 0.8m as comparing with the machine type Yanmar to the clearance 0.4m ,by a decrease of (65)%. Also, the overlap between the grain moisture and clearance is significant,.While the superiority of the overlap between the grain moisture10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% of clearance 0.4 mm by a decrease of (101.1)%. The best low rale (130.2)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance o.8 mm.

1.2.Percentage of breakage grain:

Figure 2 shows the influence of the type of machine, clearance ,grain moisture in the percentage of breakage of grain. The results

indicated that the machine type Satake was significantly better than the machine type Yanmar by a decreased of (19.4)%. This is due to high quality of the mechanical properties of the machine type Satake as compared with the machine type Yanmar. These findings are findings consistent with the of (Increasing grain moisture Shoughy,2008). leads to a significant increase and form extrusive , if excelled percentage moisture content of grain 10-12% it leads to a significant decrease, by a decrease of (17.9 and 18.1)% respectively as compared with the grain moisture 12-14% and 14-16%. Because percentage of breakage was increasing with the increasing percentage moisture of grain. These results are consistent with the results that gained by (Ali et al.,2006).However increasing the clearance between cylinders leads to a significant increase extrusive ,if excelled 0.8 on 0.6 and 0.4 mm by a decrease of (15.1 and 22.1)%. respectively. Because of the ease grain flow, leads to decrease the proportion of breakage of grain, with increasing clearance between cylinders. These results are consistent with the results that gained by (Chung et al., 2000). The overlap between the machine type clearance was significant too because it is significant better, the overlap between the machine type Satake and the clearance 0.8mm as comparing with the machine type Yanmar to the clearance 0.4mm,by a decrease of (71.5)%. While the overlap between the machine type and grain moisture is significantly .The lowest percentage breakage of grain, is when the overlap between the type machine Satake and the grain moisture 10-12% as comparing with the machine type Yanmar of the grain moisture 14-16%, by a decrease of (64.9)%.In addition, the overlap between the grain moisture and clearance is significantly .While the superiority of overlap between the grain moisture10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by a decrease of (94.6)%. The best low rate (134.2)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance o.8 mm.



Fig (1) IIIustartes the Eeffect of Machines types , Clearance and Grain Moisture in the Percentage of Cracked Grain.



1.3.Percentage of whole grain:

Figure 3 shows the influence of the type of machine, clearance , grain moisture in the percentage of whole grain. The results indicated that the machine type Satake was significantly better than the machine type Yanmar, by a (3.1)%. This is due to the increased of percentage of breakage and cracked of grain decrease leads to increase the percentage of whole grain when used the machine type compared the machine Satake as type Yanmar. These findings are consistent with the findings of (jia et al.,2005). Decreasing grain moisture leads to a significant and extrusive

percentage of breakage increasing with increase of percentage moisture of grain ,and this leads to decrease the percentage of whole grain .These results are consistent with the results that gained by(Bai et al., 2005).However increasing the clearance between cylinders leads to a significant extrusive increase ,if excelled 0.8 on 0.6 and 0.4 mm by an increase of (3.8 and 4.09)%. respectively .The rice breakage is mostly due to mechanical stress

increase , if excelled percentage moisture content of grain 10-12% it leads to a significant

increase, by an increase of (4.3 and 3.0)%

moisture 12-14% and 14-16%. Because the

respectively as compared with

the grain

leads to decrease the percentage of whole grain increased clearance between .with cylinders. These results are consistent with the results that gained by (Correa et al., 2007). The overlap between the grain moisture and clearance is significantly .While the superiority of overlap between the grain moisture10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by increase of (16.2)%. Also the overlap an between the machine type clearance is significant too because of significantly better, the overlap between the machine type Satake and the clearance 0.8mm as comparing with the machine type Yanmar to the clearance 0.4mm ,by an increase of (11.8)%. While the overlap between the machine type and grain moisture was significant, the highest percentage of whole grain, when the overlap between the type machine Satake and the grain moisture 10-12% as comparing with the machine type Yanmar to the grain moisture 14-16%, by an increase of (11.0)%. The best high rate (19.7)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance o.8 mm.

1- Stage of Bleaching Rice:

2.1.Percentage of breakage grain:

Figure 4 shows the influence of the type of machine, clearance , grain moisture in the percentage of breakage grain. The results indicate that the machine type Satake is significantly better than the machine type Yanmar, by a decreased of (7.5)%. This is due to the percentage of breakage and crack of grain increases during hulling process, leads to increase the percentage of breakage of grain when used the machine type Yanmar as compared the machine type Satake. These findings are consistent with the findings of

(Chen et al., 2012). Increasing the clearance between cylinders leads to a significant extrusive increase , if excelled 0.8 on 0.6 and 0.4 mm by an decrease of (6.9 and 10.5)%. respectively. This is due to increase compressive strength with reducing the clearance leads to increase the percentage of breakage of grain . These results are consistent with the results that gained by (Lower et al.,2003).As for the decreasing grain moisture leads to a significant and extrusive increase, if excelled the percentage moisture content of grain 10-12% it leads to a significant decrease, by a decrease of (8.7 and 10.1)% respectively as compared with the grain moisture 12-14% and 14-16%. Because it is not possible to grain afford stress shear with increasing moisture content of grain leads to increase the percentage of breakage grain. These results are consistent with the results that gained by (Altuntas et al.,2007). The overlap between the machine type clearance is significant too because it is significant better, the overlap between the machine type Satake and the clearance 0.8m as comparing with the machine type Yanmar of the clearance 0.4mm, by a decrease of (26.4)%. While the overlap between the machine type and grain moisture is significantly .The lowest percentage of breakage of grain, is when the overlap between the type machine Satake and the grain moisture 10-12%, as comparing with the machine type Yanmar to the grain moisture 14-16% .bv a decrease of (28.9)%. In addition the overlap between the grain moisture and clearance is significantly .While the superiority of overlap between the grain moisture10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by a decrease of (40.8)%. The best low rate (49.0)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance 0.8 mm.



Fig (3) IIIustartes the Effect of Machines types, Clearance and Grain Moisture in the Percentage of Whole Grain.



2.2.Percentage of cracked grain:

Figure 5 shows the influence of the type of machine, clearance , grain moisture in the percentage of Cracked grain.The results indicate that the machine type Satake is significantly better than the machine type Yanmar, by a decreased of (13.3)%. Because the percentage of cracked grain increasing ,during the stages removal husks of grain, leads to reducing in the stage bleaching . when used the machine type Satake as compared the machine type Yanmar .These findings are consistent with the findings of (Chaitep, 1998). Decreasing grain moisture led to a significant increase and form extrusive . If excelled percentage moisture content of grain 10-12% it led to a significant decrease, by an decrease of (15.0 and 22.2)% respectively ,as compared with the grain moisture 12-14% and 14-16%. This is due to moisture content of grain increased leads to increase the percentage of cracked grain in the removing husks and it is reflected on reducing in the bleaching stage. These results are consistent with the gained results that (Alizadeh by et al.,2009). While when increasing the clearance between cylinders leads to a significant extrusive increase .if excelled 0.8 on 0.6 and 0.4 mm by a decrease of (13.7 and 17.1)%. respectively. This is due to the proportion of cracked of grain decreased with increasing clearance between cylinders because of expansion slot and the friction among the grain

ISSN 2072-3875

and the husking cylinders . These results are consistent with the results that gained by (Williaams et al., 2002). The overlap between the machine type and grain moisture is significantly .The lowest percentage of cracked grain, when the overlap between the type machine Satake and the grain moisture 10-12% , as comparing with the machine type Yanmar to the grain moisture 14-16%, by a decrease of (66.9)%. In addition the overlap between the grain moisture and clearance is significantly .While the superiority of overlap between the grain moisture10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by a decrease of (97.6)%. Also the overlap between the machine type clearance was significant too because it is significantly better, the overlap between the machine type Satake and the clearance 0.8m as comparing with the machine type Yanmar to the clearance 0.4mm, by a decrease of (50.9)%. The best low rate (105.7)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance o.8 mm.

2.3.Percentage of whole grain:

Figure **6** shows the influence of the type of machine, clearance , grain moisture in the percentage of whole grain. The results indicate that the machine type Satake is significantly better than the machine type Yanmar, by an increase of (4.6)%. Because the mechanical properties and quality high of milling , when using the machine type Satake , as compared the machine type Yanmar. These findings are consistent with the findings of (Nan, 2004) . Increasing the clearance between cylinders leads to a significant extrusive increase , if excelled 0.8 on 0.6 and 0.4 mm by an increase of (6.1 and 6.8)%. respectively . Because the

effort is off on grain decreased with the increasing percentage of clearance between cylinders, hence percentage of breakage grain decreased and percentage of whole grain increase. These results are consistent with the results that gained by (Lower et al., 2003). decreasing grain moisture leads to a significant extrusive increase and if excelled the percentage moistuer content of grain 10-12% it leads to a significant increase, by an increase of (5.9 and 5.7)% respectively as compared with the grain moisture 12-14% and 14-16%. That there is an inverse relationship between the moisture content of grain and the proportion of break-up, the percentage of whole grain ,the increase moisture grain proportion results in the proportion breakage and increasing decreased the proportion of whole grain. These results are consistent with the results that gained by (Alsharifi et al., 2010). The overlap between the grain moisture and clearance is significantly .While the superiority of overlap between the grain moisture 10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by an increase of (27.9)%. Also the overlap between the machine type clearance was significant too because the significant better, the overlap between the machine type Satake and the clearance 0.8m as comparing with the machine type Yanmar to the clearance 0.4mm,by an increase of (18.4)%. While the overlap between the machine type and grain moisture is significant .The highest percentage of whole grain, is when the overlap between the type machine Satake and the grain moisture 10-12% as comparing with the machine type Yanmar to the grain moisture 14-16%, by an increase of (17.7)%. The best high rate (32.7)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance 0.8 mm.



Fig (5) III ustartes the Effect of Machines types , Clearance and Grain Moisture in the Percentage of Cracked Grain.



Fig (6) IIIustartes the Effect of Machines Types , Clearance and Grain Moisture in the Percentage of Whole grain.

2.4.Percentage of total extraction:

Figure 7 shows the influence of the type of machine, clearance , grain moisture in the percentage of total extraction. The results indicate that the machine type Satake is significantly better than the machine type Yanmar, by an increase of (1.2)%. That there is relationship between percentage of total extraction and percentage of breakage of grain, whenever break-up increases the less the total extraction of percentage and this depended on machine type .These findings are consistent with the findings of (Chaitep et al 2008) .Increasing the clearance between cylinders leads to a significant extrusive increase ,if excelled 0.8 on 0.6 and 0.4 mm by an increase of (2.0 and 1.8)%. respectively. Because there is a relationship between clearance and percentage of breakage grain ,whenever clearance increased, whenever less break-up of grain and this is reflected on the increasing proportion of the total extraction .These results are consistent with the results that gained by (Williaams et al., 2002). Decreasing grain moisture leads to a significant and extrusive increase if excelled the percentage moisture content of grain 10-12% it leads to a significant increase, by an increase of (1.8 and 1.2)% respectively as compared with the grain moisture 12-14% and 14-16%. This is to

lower susceptibility of grain on the pressure resistance inside chamber of the milling, and increasing the proportion of break-up and cracked of grain ,this is reflected on the percentage of total extraction . These results are consistent with the results that gained by (Saudi,2008). The overlap between the machine type clearance is significant too because significant better, the overlap between the machine type Satake and the clearance 0.8mm as comparing with the machine type Yanmar to the clearance 0.4mm ,by an increase of (5.1)%. In addition the overlap between the grain moisture and clearance is significant .While the superiority of overlap between the grain moisture 10-12% and clearance 0.8mm on overlap between the grain moisture 14-16% to clearance 0.4 mm by an increase of (7.1)%. While the overlap between the machine type and grain moisture is significant .The highest percentage of total extraction, is when the overlap between the type machine Satake and the grain moisture 10-12% as comparing with the machine type Yanmar to the grain moisture 14-16%, by an increase of (4.6)%. The best high rate (8.7)% have come from the triple overlap among type Satake ,grain moisture 10-12% and clearance 0.8 mm.



Moisture in the Percentage of Total Extraction.

Conclusions:

- 1- The machine type Satake is significantly better than the machine type Yanmar in all studied traits.
- 2- The grain moisture content 10-12% is superior significant on two levels 12-14%, 14-16% in all studied traits. For both two stages, hulling and bleaching respectively.
- 3- The clearance between cylinders 0.8 mm is superior significant on others two clearance 0.4 ,0.6 in all studied traits. For both two stages, hulling and bleaching respectively.
- 4- The overlap between the machine type Satake and moisture content of grain 10-12% superior significantly in all studies traits, and also the overlap between the machine type Satake to clearance 0.8 in all studied traits as compared whit the overlap of the machine type Yanmar with moisture content of grain and clearance between cylinders in all studied traits. For both two stages, hulling and bleaching respectively.
- 5- The best results have come from the triple overlap among machine type (Satake), grain moisture 10-12%, and clearance 0.8

mm For both two stages, hulling and bleaching respectively.

Recommendations:

- Carry out studies using other of machinery types and other varieties of paddy.
- To conduct other organizations on machine and the moisture content of grain to know their effect on the qualitative characteristics of paddy.

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