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A study some qualitative characteristics of cultivar rice Tarm Hashemi.

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Abstract: The present experiment has been conducted to evaluate in some qualitative characteristics of husking machine for rice cultivar TarmHashemi, in the labrotaries of the Tehran University in 2015. This research includes the using of two types of machines (Satake and Yanmar),under three clearance between cylinders levels 0.4 , 0.6 and 0.8mm and three grain moisture levels 10-12% ,12- 14% and 14-16%.The results indicate that the Satake type machine is significantly better than the Yanmar type machine in all studies traits .While clearance o.8 significant superiorly than two levels 0.4,0.6 mm in all studies traits.As well as moisture cotent of grain 10-12% is superior significantly than two levels 12-14%,14-16% in all studied traits.While the overlap between the Satake type machine and grain moisture content 10-12% superior significantly and also overlap between the Satake type machine and clearance 0.8. in all studied traits,as compared with the overlap of the Yanmar type machine with moisture content of grain and the clearance in all studied traits . The best results have come from the triple overlap among Satake type machine, grain moisture 10-12%, and clearance 0.8 mm in all studies traits,
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Keywords:Grain moisture, Clearance , Husking , Qualitative characteristics , Rice

1. Introduction:

Rice (Oryza Sativa L.) is one of the leading food crops of the world and is second only to wheat in terms of annual production for food use. is crucial to food security for at least half the world population. New varieties with high yield potential, good quality and high esistance to biotic and abiotic stresses are needed in order to meet the demand for more food arising from the rapid human population growth and concurrent decrease in arable land."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."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 yields of long-grain rice.Also it is concluded that for each one percent decrease in rice moisture content, head yields and total yields increased .as well as it has found that rice breakage at milling was mostly due to mechanical stresses rather than thermal stresses. "Al maamouri et al.(,2008)". Studied the effect of moisture content on the rice breakage during the milling process.the samples used are with moisture content of 12 to 16% and concluded that rice breakage decreased with increase of paddy moisture.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."Al shrifi et al.,(2007)".Mentioned 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."Najim ,(2000)". Explored that the machine productivity is affected by moisture content as increasing machine productivity with increasing moisture content of grain and the low percentage of breakage."Chung et al.,(2003)".Explored that the comparison of milling efficiency factors between experimental results and simulation results .The differences of hulling efficiency, milling efficiency, milled paddy recovery between experiment and simulation are 0_4, 0_7, 0_4%, respectively. Although the simulation results are a little lower than experimental ones, they are close. The materials produced in the processes of simulation are compared with those in experiment. "Shoughy,(2008)". Concluded that the brown rice whose moisture content was12.5% was 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 were 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. "Hossain et al.,(2009)".Concluded that the suitable harvest time for higher head paddy yield of three aromatic paddy cultivars of Bangladesh."Al sharifi et al.,(2010)".Have showed that broken grain size which is less than a quarter of the length of the pill and back are 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 grain harvest in the pre-manufacturing stage. "FAO,(2012)".Despite taking precautions and using low drying kinetics, the broken paddy ratio is still too high and results in a relatively low yield of head paddy. After industrial milling,100 kg of paddy yields about 60 kg of white paddy, 10 kg of broken grains, 10 kg of bran and flour, and 20 kg of hulls. "Hussain,(2009)".One of the important factors for the grain milling process is the clearance between the cylinders and moisture grain as affected by cereal provided to maunfacturing these two factors

2. Materials and methods

The present experiment has been carried out in the laboratory of Tehran University in season of 2014-2015 using two types of hulling machines experiment (Satake and Yanmar) is a main factor are under three grain moisture levels 10-12% , 12-14% and 14-16%.The secondary factors are three clearance levels 0.4, 0.6 and 0.8 mm which are under secondary factors, random semples are taken paddy cultivar (TarmHashemi) by probe and collected on a form of heaps and the number of heaps are six .Each heap weight 160kg, according to the method used by (Alshrifi et al.,2009).Paddy is cleaned to remove all exotic matters,broken and immature grains using sieves.Then the random samples are taken from per heaps weight 1000gm.The initial moisture content of paddy grain is determined by oven drying methods at 103c for 48h according to the method used by (Sacilik et al.,2003). The paddy is kept in an oven at temperature of 43c and monitored carefully of TarmHashemi cultivar . when determining the moisture content of grain 14-16% the sample is taken and place in Precision divider to get a sample of weight 200gm ,then the samples are carefully sealed in polythene bags. Then organization of the Satake type machine on clearance between cylinders 0.8mm and speed 4.7m\sec.This sample which weight 200g is placed in the Satake type machine to remove the husk from paddy grain . After taking out the sample from the machine,it is placed in cylindrical insulation device of satake type,will operating time which is adjusted for 2 minutes and the angle of inclination is 25 degree insolating the broken and full grain for all size.The following indicators are 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

2.1. Percentage of 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 are the most important factor contributing to rice breakage during milling. This results in reduces milled rice recovery and head rice yields. Eq1 (Ali et al.,2006)

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

Where: P_{Cg} :is proportion of cracked grain (%), W_{Cg} :is weight cracked grain (g) and W_S :is weight sample used (g).

2.2.Percentage of brown rice :

The Eq .2 represents the amount of grain produced by the process of husking which included percentage of breakage and percentage of cracked grain .(Alwakel 1999):

$$P_{obr} = \frac{W_{br}}{W_S} \times 100 \quad (2)$$

Where: P_{Obr} :is percentage of brown rice (%) W_{br} : Is weight of brown rice . (g) and
W_S :Is weight of rice sample used.(g).

2.3.The husking efficiency ; The husking efficiency is determined by using Eq .3 (Minaei et al.,2007)

$$P_E = \frac{W_S - W_{RU}}{W_S} \times 100 \quad (3)$$

Where;P_E :is The husking efficiency(%), W_{RU}: is weight of paddy unhuskinged(g) and
W_S :is weight of paddy sample used(g).

2.4.Precentage of head rice :

Percentage of head rice Eq.4 represents the amount of head rices resulting from the cruching process and is free of broken grains . (Ali,2002)

$$P_{Fg} = \frac{W_{Fg}}{W_S} \times 100 \quad (4)$$

Where: P_{Fg}:is the proportion of whole grain .(%),W_{Fg} :is weight head rice (g) and
W_S:is weight of rice sample used.(g).

2.5.Precentage of palea and lemma:

Is the remnants of the hulling process and used as food for animals. Eq.5(Al shrifi, 2010) ;

$$P_{PL} = \frac{W_{SR} - W_{SbR}}{W_{SR}} \times 100 \quad (5)$$

Where:P_{PL} :is precentage of palea and lemma (%), W_{sR} :Is weight sample rice(g) and
W_{SbR} :Is weight sample of brown rice (g).

2.6.Proportion of breakage rice :

The Eq.6 is used to calculat the percentage of the head rices.and brokens in the separation process of the broken rice from the whole grains (Gbabo et al.,2014)

$$P_{Br} = \frac{W_{br}}{W_s} \times 100 \quad (6)$$

Where: P_{Br}:is the proportion of breakage rice (%),W_{br} :is the weight of breakage grain (g) and W_s : Is the weight of rice sample used(g).

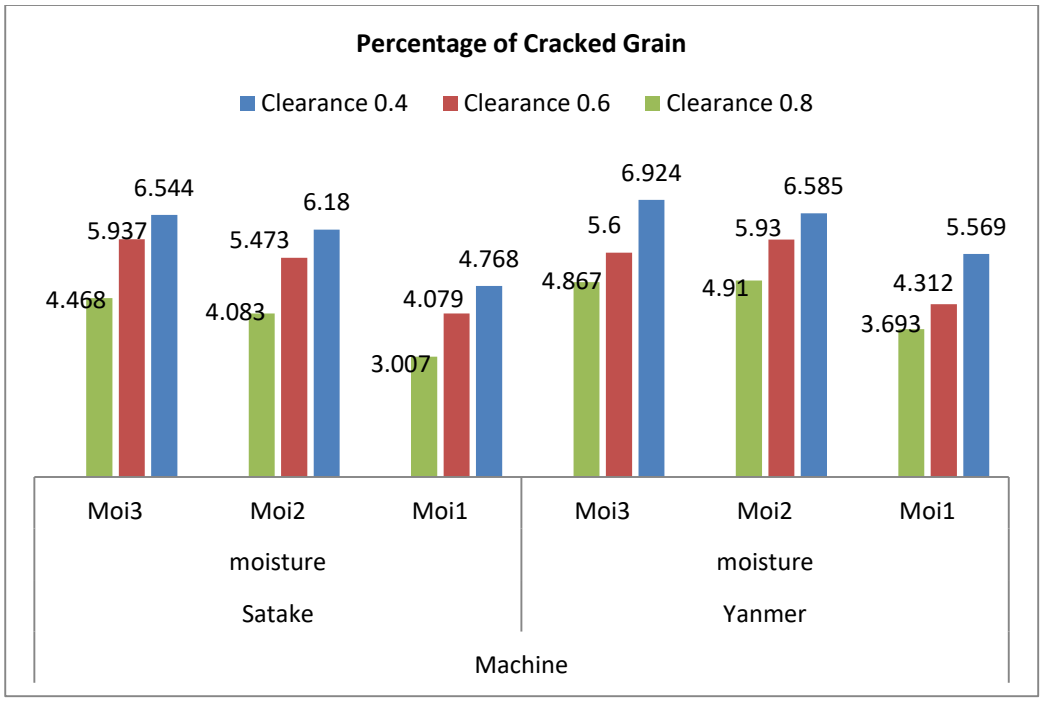
Then by repeating the same method and measurements of the previous using of the Satake type machine , grain moisture content 12-14%, 14-16% and clearances 0.6,0.4 mm and three replications for paddy clutivar (TH) .Then by repeating the same steps and all accounts using of the Yammer type machine and each moisture content of grain and each clearance for same cultivra . Results are analyzed statistically using the design C R Dand tested the difference among treatment each factor according to the test LSD less significant difference 0.05.(Alsahoeke et al.,1990).

Fig (4) IIlustartes the Effect of Machines Types , Clearance and Grain Moisture on the Percentage of Head Rice.

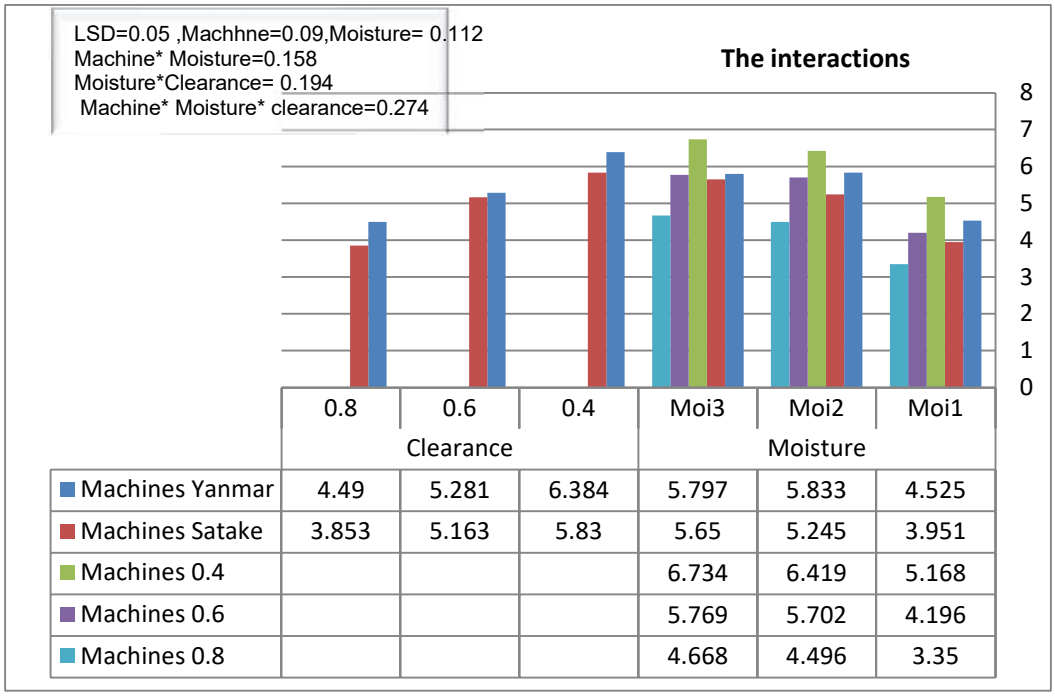
3.Results and Discussion

3.1.Percentage of cracked grain

Figuer 1 shows the influence of the type of machine, clearance, and grain moisture on the percentage of cracked grain%. The results indicate that increasing the clearance between cylinders leads to decrease the cracked percentage of the machine, and the results are 6.107 ,5.222and 4.171 %respctively,by a decrease of 16.9 and 25.2%, bacause the low pressuer on the grain in the huskinging chamber with increased clearance between cylinders.These results are consistent with the results that gained by (Lee,2015). As for the increasing the grain moisture leads to increasing of the percentage of cracked grain, and the results are 4.238 , 5.539 and 5.723% respectively with an increase percentage 30.6 and 3.3 % respectively. This is due to the fragility of the rice grains and increasing the pressure ,this leads to increase the percentage of cracked grain with grain moisture decrease .This is consistent with (USDA, 2006). However the Satake type machine is significantly better than the Yanmar type machine . The results that gained from this process are 5.385 and 4.949% respectively and by a decrease 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 the Yanmar type machine.These findings are consistent with the findings of (Alshrifi et al.,2007).The overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the lowest proportion of cracked grain 3.853% as compared with the Yanmar type machine and the clearance 0.4 mm which provides the highest percentage of cracked grain 6.384% and by a decrease of 65.7%. As for the overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the lowest percentage of cracked grain 3.951% as compared with the Yanmar type machine with the grain moisture14-16% which provides the highest percentage of cracked grain 5.797% and by a decrease of 46.7%.While the overlap between the grain moisture and clearance is significant because the overlap between the grin moisture 10-12% and the clearance 0.8 mm provides the lowest percentage of cracked grain 3.350% as compared with the grain moisture 14-16% with the clearance 0.4 mm which provides the highest percentage of cracked grain 6.734% and by a decrease of 101.0%.The best results 3.007% have come from the triple overlap among Satake type machine, grain moisture 10-12%, and clearance 0.8mm.Cracked Grain.



Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	18.693	18.277	17.842	18.511	19.102
Average of clearance	0.4	0.6	0.8		
	19.046	18.448	17.960		



	0.8	0.6	0.4	Moi3	Moi2	Moi1
Machines Yanmar	4.49	5.281	6.384	5.797	5.833	4.525
Machines Satake	3.853	5.163	5.83	5.65	5.245	3.951
Machines 0.4				6.734	6.419	5.168
Machines 0.6				5.769	5.702	4.196
Machines 0.8				4.668	4.496	3.35

Fig (1) IIlustartes the Eeffect of Machines types , Clearance and Grain Moisture on the Percentage of

3.2.Brown rice percentage

Figuer 2 shows the influence of the type of machine, clearance, and grain moisture on the percentage of brown rice%, results indicate that the Satake type machine is significantly better than the Yanmar type machine. The results which get to are81.307 and 81.723% respectively. The percentage of brown rice has increased 0.51%. This is due to there is positive relationship between percentage of raw rice and percentage of Palea and Lemma. when used the Satake type machine as compared the Yanmar type machine.These findings are consistent with the findings of (Jia et al.,2005)%. As for the increasing the grain moisture leads to decreasing of the percentage of brownrice , and the results are 82.158 , 81.489 and 80.889 % respectively, with the increase percentage 0.82 and 0.74 % respectively. Because increased moisture content of grain, led to decreased percentage of Palea and Lemma, hence decreased percentage of brown rice.These results are consistent with the results that gained by (Alwakel, 1999). In additon increasing the clearance between cylinders leads to increase the percentage of brown rice , and the results are 80.937 , 81.552 and 82.080 % respctively, and by an increase of 0.75and 0.59 %. This is due to milling process quality with increasing clearance among cylinders hence decreased percentage of raw rice.These results are consistent with the results that gained by (Shoughy,2008). The overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the highest the percentage of brown rice 82.453% as compared with the Yanmar type machine with the grain moisture14-16% ,which provides the lowest the percentage of brown rice 80.590% and by an increase of 2.3 %.While the overlap between the grain moisture and clearance is significant because the overlap between the grin moisture 10-12% and the clearance 0.8 mm provides the highest the percentage of brown rice 82.158% as compared with the grain moisture 14-16% and the clearance 0.4 mm which provides the lowest percentage of brown rice 80.281% and by an increase of 2.4 %. In addition the overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the highest percentage of brown rice 82.262% as compared with the Yanmar type machine with the clearance 0.4 mm which provides the lowest percentage of brown rice 80.733 % and by an increase of 1.9 %, the best results 82.976 % have come from the triple overlap among Satake type machine, grain moisture 10-12%, and clearance 0.8 mm . .

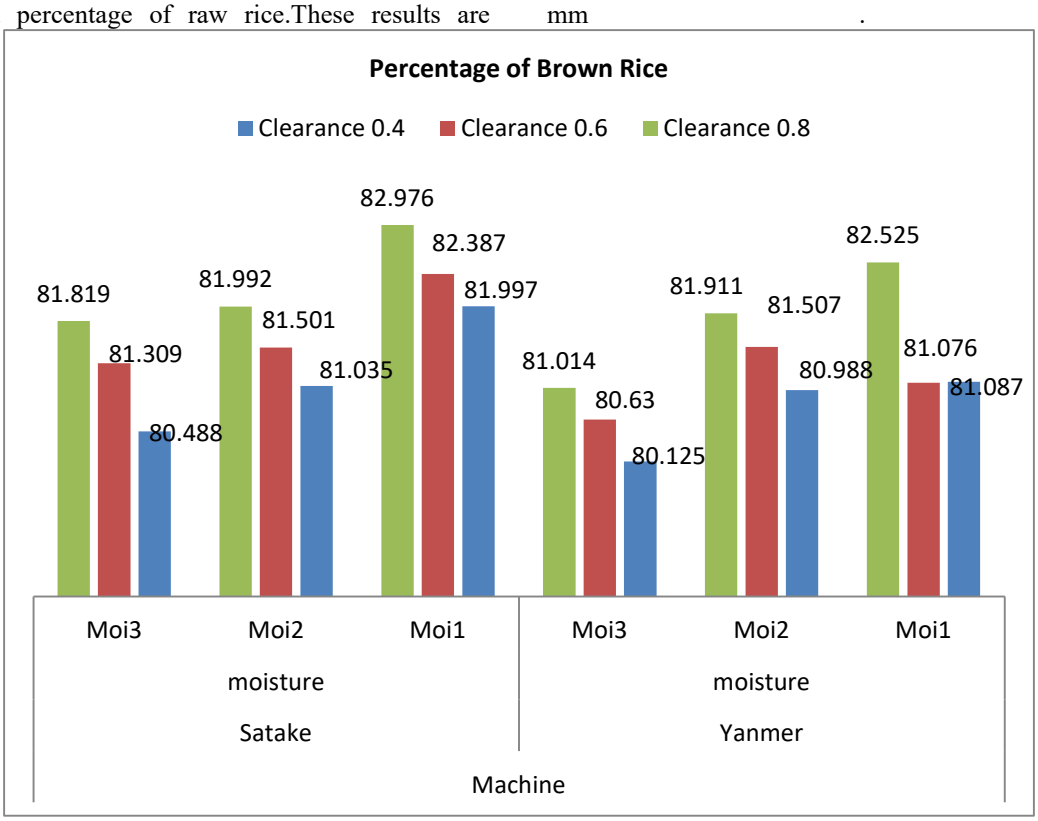
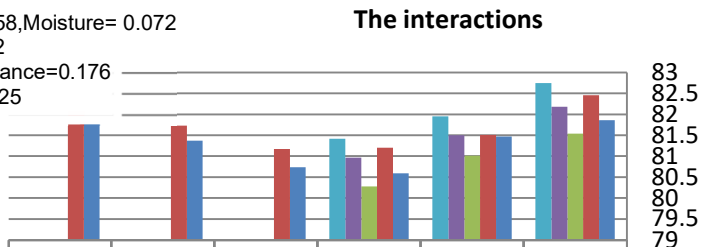


Fig (2) IIlustartes the Effect of Machines Types , Clearance and Grain Moisture on the Percentage of Brown Rice

Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	81.307	81.723	82.158	81.489	80.889
Average of clearance	0.4	0.6	0.8		
	80.937	81.552	82.040		

LSD=0.05,Machhne=0.058,Moisture= 0.072
Machine* Moisture=0.102
Machine* Moisture* clearance=0.176
Moisture*Clearance= 0.125



	0.8	0.6	0.4	Moi3	Moi2	Moi1
Machines Yanmar	81.817	81.371	80.733	80.59	81.469	81.863
Machines Satake	82.262	81.732	81.174	81.206	81.509	82.453
Machines 0.4				80.281	81.012	81.542
Machines 0.6				80.969	81.504	82.182
Machines 0.8				81.417	81.952	82.75

3.3. The husking efficiecy

Figuer 3 shows the influence of the type of machine, clearance, and grain moisture on the husking efficiency% . The results indicate that the Satake type machine is significantly better than the Yanmar type machine. The results which get to are 84.589 and 82.494 % respectively. The husking efficiency has increased 2.5 % . this is due that of the machine fit required volume of work hence increasing the husking efficiency as for Satake type machine. These results are consistent with the results that gained by (Najim,2000). As for the increasing the grain moisture leads to decreasing of the husking efficiency , and the results are 85.336, 83.578 and 81.711% respectively, with the increase percentage 2.1and 2.3 % respectively. This is due to the non-use of energy available to the entire machine , due to blockage of the cavities of the machine when increasing the moisture content of grain hence decreasing the husking efficiency. Reported results are by (Chung et al.,2003) .Increasing the clearance between cylinders leads to the husking efficiency decrease , and the results are 84.490, 83.371 and 81.764 % respctively,and by a decrease of 1.3 and 1.9%.The decreasing of the husking efficiency this is due to the blockage of cavities of the machine when they are low in clearance .These results are consistent with the results that gained by (Minaei et al.,2007) .The overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the highest the husking efficiency 86.304% as compared with the Yanmar type machine with the grain moisture14-16% which provides the lowest the husking efficiency 80.981% and by an increase of 6.5%. As for the overlap between the grain moisture and clearance is significant because the overlap between the grin moisture 10-12% and the clearance 0.8 mm provides the highest the husking efficiency 87.379 % as compared with the grain moisture 14-16% and the clearance 0.4 mm which provides the lowest husking efficiency 80.133% and by an increase of 9.0%. While the overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the highest husking efficiency 86.323% as compared with the Yanmar type machine and the clearance 0.4 mm which provides the lowest husking efficiency 80.641% and by an increase of 7.0%.While the best results 87.936 % have come from the triple overlap between Satake type machine, grain moisture 10-12%, and clearance 0.8mm.

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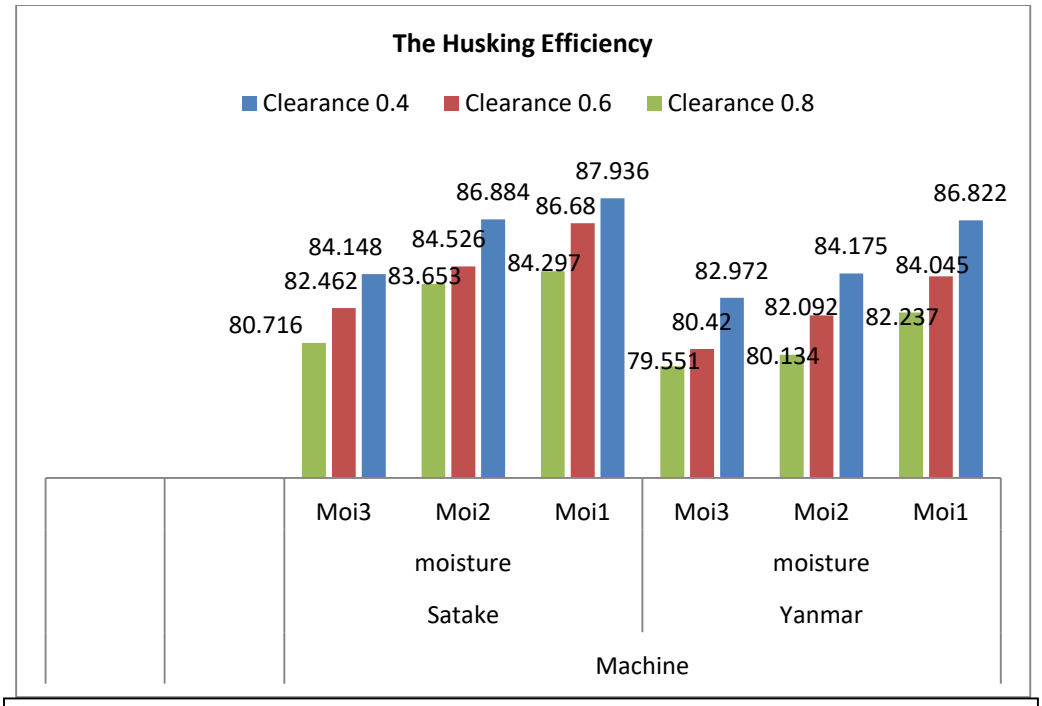
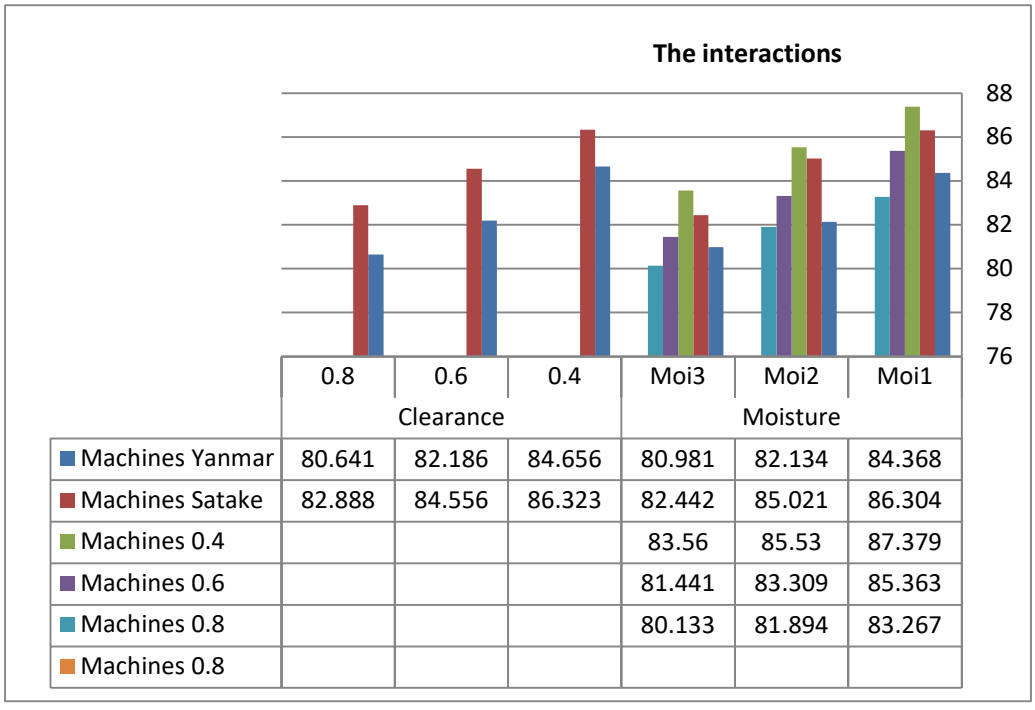


Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	69.284	69.898	70.560	69.379	68.942
Average of clearance	0.4	0.6	0.8		
	68.898	69.711	70.272		

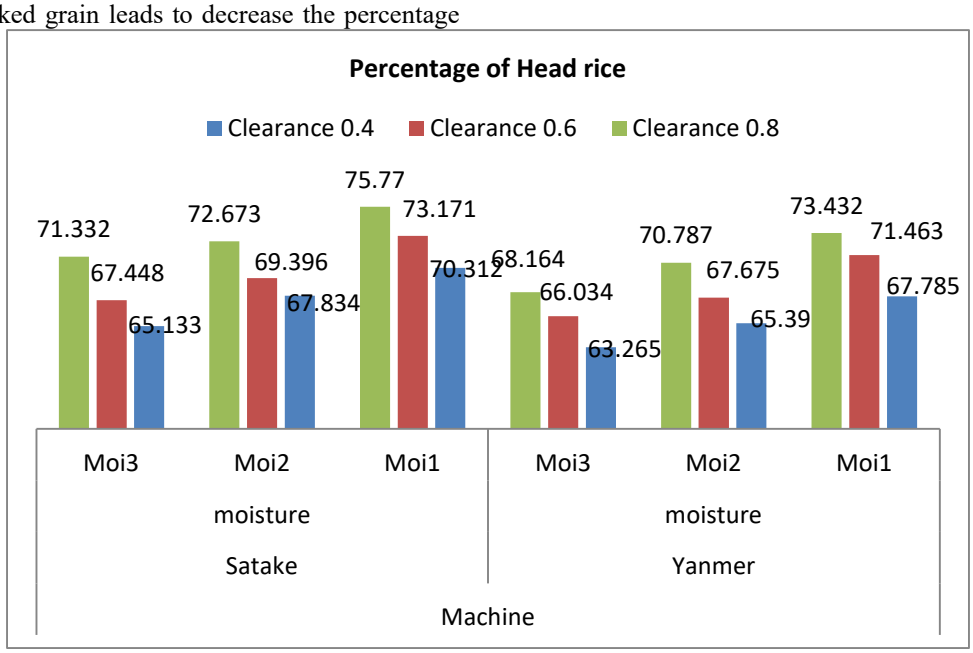


	0.8	0.6	0.4	Moi3	Moi2	Moi1
Machines Yanmar	80.641	82.186	84.656	80.981	82.134	84.368
Machines Satake	82.888	84.556	86.323	82.442	85.021	86.304
Machines 0.4				83.56	85.53	87.379
Machines 0.6				81.441	83.309	85.363
Machines 0.8				80.133	81.894	83.267
Machines 0.8						

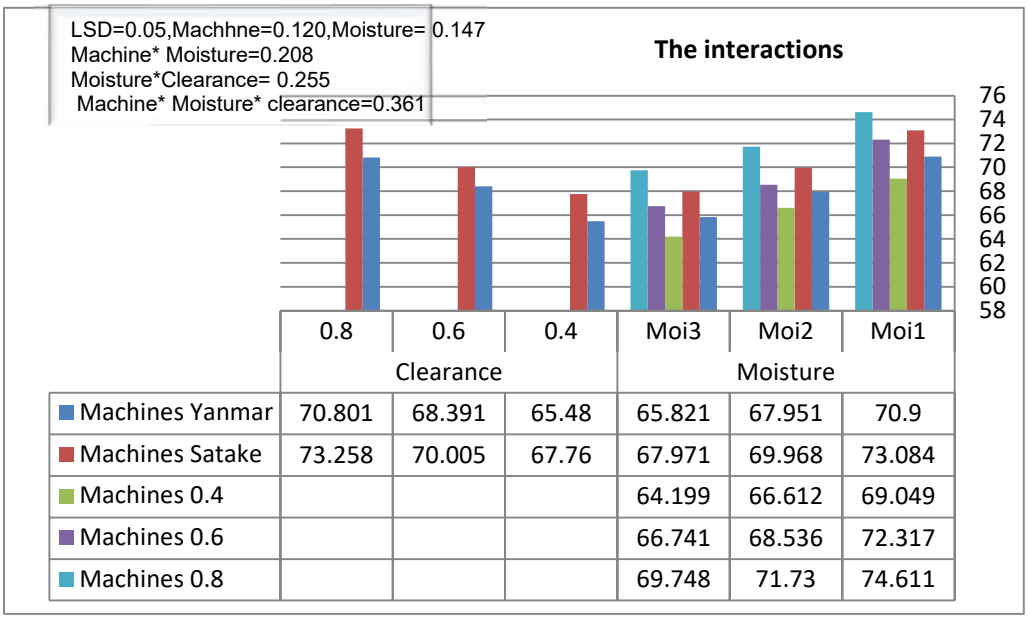
Fig (3) IIlustartes the Effect of Machines Types , Clearance and Grain moisture on the Husking Efficiency

3.4.Head rice percentage

Figuer 4 shows the influence of the type of machine, clearance, and grain moisture on the percentage of head rice%. The results indicate that the Satake type machine is significantly better than the Yanmar type machine. The results that gained from this process are 70.341and 68.224 % respectively. The percentage of head rice increase 3.1 % . This is due to the precentage of breakage decrease when using of Satake type machine as compared with Yanmar type machine which gives highest percentage of breakage hence decrease percentage of head rice .These results are consistent with the results that gained by (FAO,2012). Increasing the clearance between cylinders leads to increase the percentage of head rice , and the results are 66.620,69.361 and 72.332 % respctively and by an increase of 4.1 and 4.3%. because increasing the percentage of breakage with the decreasing clearance between cylinders and reflected negatively on the ratio of head rice. These results are consistent with the results that gained by (Hussain et al.,2009). As for the increasing the grain moisture leads to the decreasing of the percentage of head rice,and the results are71.992,68.959 and 66.896 % respectively, with decrease percentage 4.4and 3.0 % respectively. This is due to the increasing of broken grains , bran as well as ratio of cracked grain leads to decrease the percentage of head rice . Reported results are by(Ali et al.,2007).The overlap between the grain moisture and clearance is significant because the overlap between the grain moisture 10-12% and the clearance 0.8 mm provides the highest percentage of head rice 74.611% as compared with the grain moisture 14-16% and the clearance 0.4 mm which provides the lowest percentage of head rice 64.199% and by an increase of 16.2%. The overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the highest proportion of head rice 73.730% as compared with the Yanmar type machine with the clearance 0.4 mm which provides the lowest proportion of head rice 65.480% and by an increase of 12.6%.While the overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the highest percentage of head rice 73.024% as compared with the Yanmar type machine and the grain moisture14-16% which provides the lowest percentage of head rice 65.821% and by an increase 10.9%. The best results 75.770% have come from the triple overlap among Satake type machine, grain moisture 10-12%, and clearance 0.8 mm,



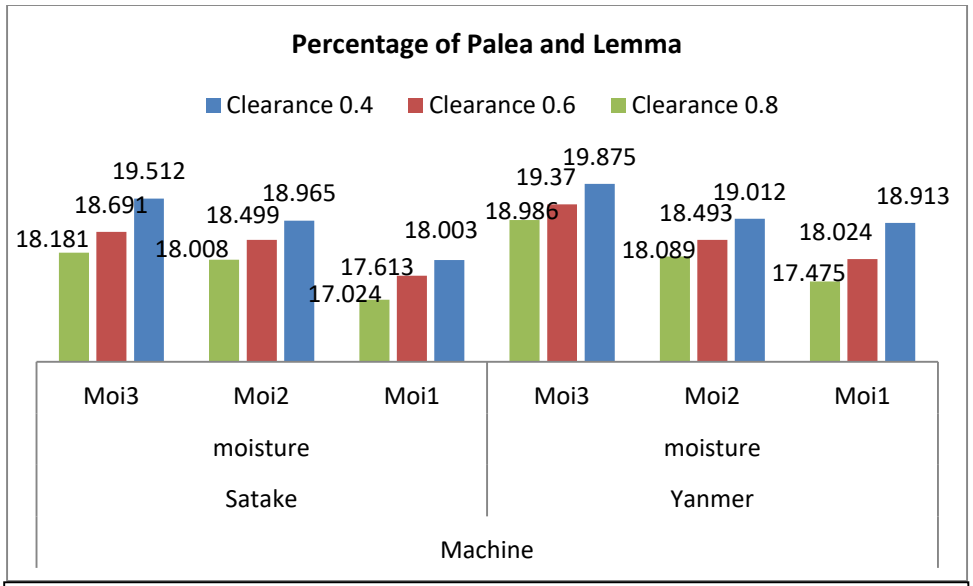
Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	69.284	69.898	70.560	69.379	68.942
Average of clearance	0.4	0.6	0.8		
	68.898	69.711	70.272		



3.5.Palea and lemma percentage

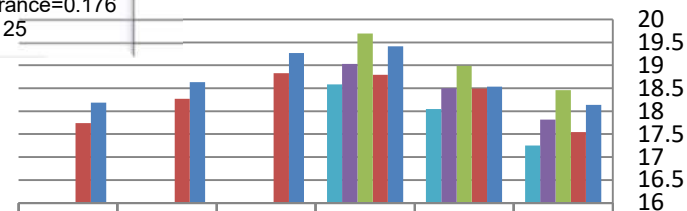
Figuer **5** shows the influence of the type of machine,clearance ,grain moistuer on the percentage of Palea and Lemma% .The results indicate that the Satake type machine is significantly better than the Yanmar type machine .The results gained from this process are 18.693 and 18.277 %respectively by a decreased of (2.2)%. because the flow of grain process, using the Satake type machine as compared with theYanmar type machine.These findings are consistent with the findings of (Alshrifi,2010).When increasing the clearance between cylinders leads to decrease the percentage of palea and lemma and the results ara 19.046,18.448 and 17.960%,respectively and by a decrease of3.2and2.7%. respectively,This is due to than increased clearance area among cylinders leads to decreased percentage Palea and Lemma .These results are consistent with the results that gained by (Hussain,2009).As for the increasing grain moisture leads to the increasing of the percentage of palea and lemma and the results are 17.842 , 18.511 and 19.102 %,and by an increase of 3.7 and 3.2% respectively . Because to than increasing moisture content of grain ,leads to smash parts very small with husking, and this lead to increased percentage of Palea and lemma.This is consistent with(Shoughy,2008).The overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the lowest percentage of palea and lemma 17.842% as compared with the Yanmar type machine and the grain moisture14-16% which provides the highest percentage of palea and lemma 19.102% and by a decrease of 10.6%. The overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the lowest proportion of palea and lemma 17.738% as compared with the Yanmar type machine and the clearance 0.4 mm which provides the highest percentage of palea and lemma19.267% and by a decrease of 8.6%.While the overlap between the grain moisture and clearance is significant because the overlap between the grin moisture 10-12% and the clearance 0.8 mm provides the lowest percentage of palea and lemma17.250% as compared with the grain moisture 14-16% and the clearance 0.4 mm which provides the highest percentage of palea and lemma19.693%,and by a decrease of 12.4%.The best results 17.024% have come from the triple overlap between Satake type machine, grain moisture 10-12%, and clearance 0.8 mm,

Fig (5) IIIustartes the Effect of Machines Types , Clearance and Grain Moisture on the Percentage of Palea and Lemma.



Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	18.693	18.277	17.842	18.511	19.102
Average of clearance	0.4	0.6	0.8		
	19.046	18.448	17.960		

LSD=0.05,Machhne=0.058,Moisture= 0.072
Machine* Moisture=0.102
Machine* Moisture* clearance=0.176
Moisture*Clearance= 0.125



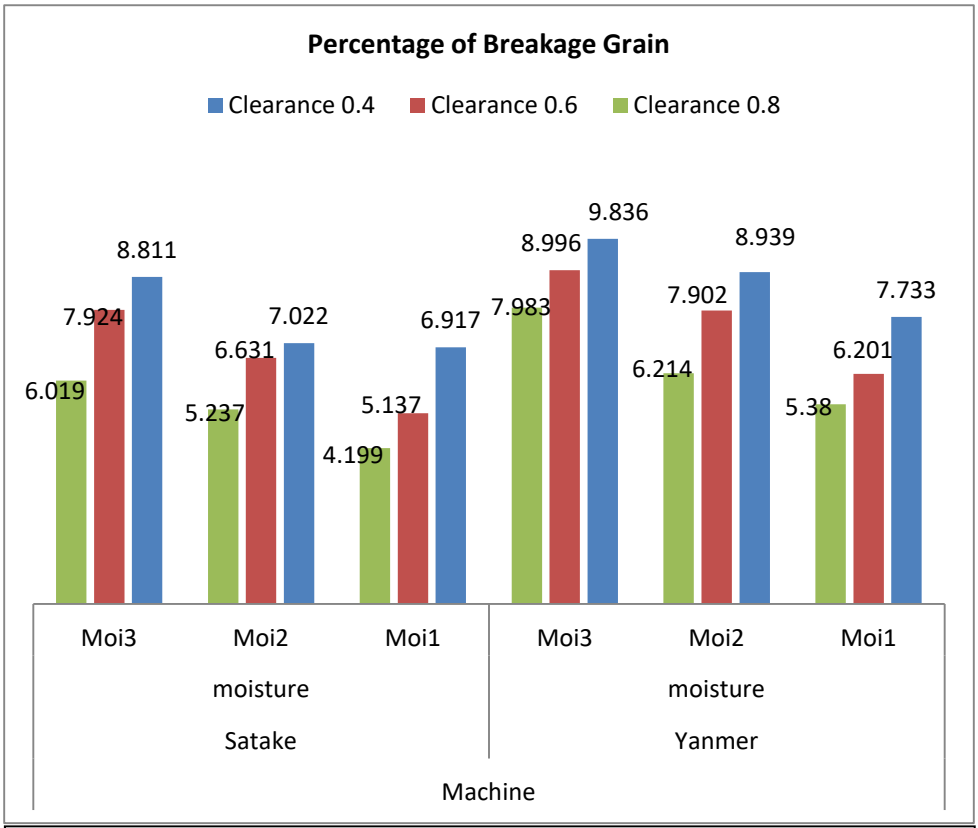
	0.8	0.6	0.4	Moi3	Moi2	Moi1
Machines Yanmar	18.183	18.629	19.267	19.41	18.531	18.137
Machines Satake	17.738	18.268	18.826	18.794	18.491	17.547
Machines 0.4				19.693	18.988	18.458
Machines 0.6				19.03	18.496	17.819
Machines 0.8				18.583	18.048	17.25

6-Percentage of breakage grain

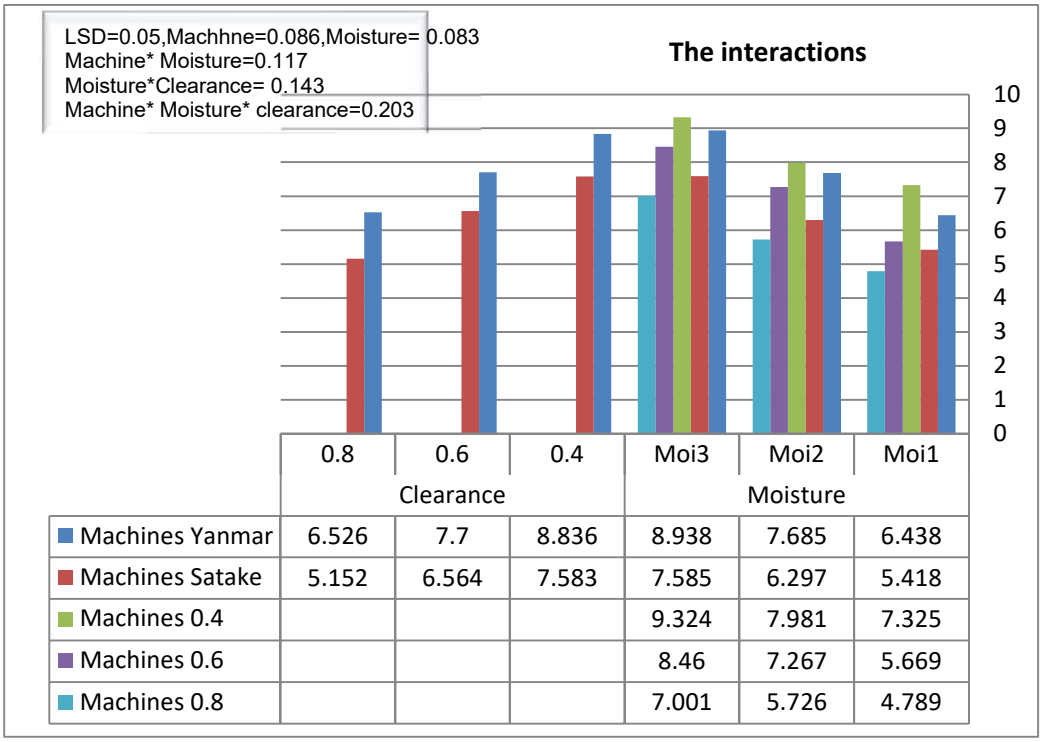
Figuer 6 shows the influence of the type of machine, clearance, and grain moisture on the percentage of breakage %.The results indicate that increasing the clearance between cylinders leads to decrease the breakage percentage of the machine, and the results are 8.210,7.132 and 5.839 %respctively by a decrease of 15.1 and 22.1%,respctively because the low pressure of on the grain during of milling process, hence percentage of breakage decrease with increasing clearance among cylinder.These results are consistent with the results that gained by (FAO,2012).As for the increasing the grain moisture leads to increasing of the breakage of percentage, and the results are 5.928, 6.991 and 8.261% respectively with an increase percentage 15.2 and 18.1 % respectively.Because paddy kernels are exposed to mechanical pressure and this leads to breaking of paddy grain when increased moisture content of grain in the reported results by(Al maamouri et al.,2008).However the Satake type machine is significantly better than the Yanmar type machine. The results that gained from this process are

6.433and 7.687 % respectively. The percentage of breakage increased 19.4 % .The reason for this is efficiency and type of machine as well as their ability to perform the requested operation .These findings are consistent with the findings of (Gbabo et al.,2014).The overlap between the machine type and clearance is significant too because the overlap between the Satake type machine and the clearance 0.8 mm provides the lowest proportion of breakage 5.152% as compared with the Yanmar type machine and the clearance 0.4 mm which provides the highest percentage of breakage 8.836% and by a decrease of 71.5%. As for the overlap between the machine type and grain moisture is significantly significant because the overlap between the Satake type machine and the grain moisture 10-12% provides the lowest percentage of breakage 5.418% as compared with the Yanmar type machine and the grain moisture14-16% which provides the highest percentage of breakage 8.938% and by a decrease of 64.9%.While the overlap between the grain moisture and clearance is significant because the overlap between the grin moisture 10-12% and the clearance 0.8 mm provides the lowest percentage of breakage 4.789% as compared with the grain moisture 14-16% and the clearance 0.4 mm which provides the highest of breakage percentage 9.324% and by a decrease of 94.7%.The best results 4.199% have come from the triple overlap among Satake type machine, grain moisture 10-12%, and clearance 0.8 mm,

Fig (6) IIIustartes the Effect of Machines Types , Clearance and Grain Moisture on the Percentage of Breakage Grain.



Average of Machines and Moisture	Yanmar	Satake	Moi1	Moi2	Moi3
	7.687	6.433	5.928	6.991	8.261
Average of clearance	0.4	0.6	0.8		
	8.210	7.132	5.839		



	0.8	0.6	0.4	Moi3	Moi2	Moi1
	Clearance			Moisture		
Machines Yanmar	6.526	7.7	8.836	8.938	7.685	6.438
Machines Satake	5.152	6.564	7.583	7.585	6.297	5.418
Machines 0.4				9.324	7.981	7.325
Machines 0.6				8.46	7.267	5.669
Machines 0.8				7.001	5.726	4.789

4.Conclusions

The Satake type machine is significantly better than the Yanmar type machine in all studied traits.The grain moisture content 10-12% superior significantly on the two levels 12-14% ,14-16% in all studied traits .The clearance between cylinders 0.8 mm superior significantly on two clearance 0.4 ,0.6 in all studied traits. The overlap between the Satake type machine and moisture content of grain 10-12% superior significantly in all studies traits. And also overlap between the Satake type machine and clearance is 0.8 in all studied traits,as compared the overlap of the Yanmar type machine with moisture content of grain and clearance between cylinders in all studied traits. The best results have come from the triple overlap among Satake type machine, grain moisture (10-12%), and clearance 0.8 mm.

5.Recommendations

- The present recommends to carry out future studies using other of machinery types and other varieties of paddy.
- Conduct other organizations on machine and the moisture content of grain to know thier effect on the qualitative characteristics of paddy.

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