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EFFECT OF NUMBERS OF CUTTING TIMES ON YIELD COMPONENTS OF OAT CULTIVARS

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Abstract

A field experiment was conducted during winter season in 2017-2018 at Research Station of Agriculture College, Al Muthanna University, located by Euphrates river in Um Al Akaf (9 kilometers north east of Al –Samawa), to know effect numbers of cuts times on yield components of oat cultivars. The experiment was including cutting managements (zero cut, one cut and two cuts) for three oat cultivars (Wild oat, Carrolup and Genzania). The layout of the experiment was a split-plot design with three replicates. Cultivars used in sub plots and the cutting treatments used in main plots. The results showed Wild Oat cultivar gave the highest weight of thousand grains was 31.59 g, harvest index was 35.11 % and grain yield was 2.202 ton per hectare. However, Carrolup gave the highest mean of protein percentage of grains was 15.346%. Also, the results showed control treatment, zero cut, gave the best respond to thousand grain weight, biological yield, harvest index and grain yield was 2.267 ton per hectare. While, the two cuts treatment for green forage yield showed highest average of forage and dry forage yield were 1300 and 0.2222 kilogram per hectare.

Key words : Cutting times, yield, oat, cultivars.

Introduction

The oat crop, *Avena sativa* L., is annual plant and one of winter forage crops and relates to Poaceae family. Oat contains high amount of a kind of melted fibers called *B-Glucan* that cause reducing the Cholesterol in addition to it contains proteins like these in Soybean (Mozaffarian and Lichenstein, 2005 and Chen *et al*., 2004). Russia, USA, Canada and Australia are the first countries produced the oat, about 74% of oats production used in feeding animals by different ways because oat leaves are soft and has higher nutrition value that animals like it (Lin *et al*., 2010). The cultivated area of oat in the world was about 26.5 million hectare and the production was 44.5 million tons (FAO, 2004). The excessive genotypes and adapted to local conditions with response to cutting can be used to increase the yield cultivation area and the production for supplying agriculture economy and supply the needs of animal production of green and dry forage. Because of a few number of studies about oat crop and its despondence to cutting repetition, this study conducted to different oat cultivars.

Materials and Methods

A field experiment was conducted during winter season in 2017-2018 at Research Station of Agriculture College, Al Muthanna University, located by Euphrates river in Um Al Akaf (9 kilometers north east of Al–Samawa), during winter season 2017-2018. The ground of the experiment was prepared by plowing two perpendicular planks with the mold board plow. The soil was softened and then equalized. The field according to design divided into plots of $2m \times 2m = 4m^2$. The layout of the experiment was a split-plot design with three replicates to know the effect of two factors. The first factor was three levels of cutting in main-plots and the second factor was three cultivars in sub-plots that distributed randomly within each sector and the total of experiment units was 27 units ($3 \times 3 \times 3 = 27$ units). The seeds cultivated in average 100 kg h^{-1} (Devi *et al*., 2014), by lined method and dated 27/10/2017. The space between lines was 20 cm and the seeds covered with hand-comb in this experiment. The vegetate irrigation gave after cultivation. Also, the process of irrigation and weeding was don when it was necessary. Urea fertilizer (N 46%) used as a

source of Nitrogen, added on the first time after two weeks of planting, and other times of fertilizer added after each cu in order to help the plant growing up after cutting in amount (120 kg N h^{-1}). Phosphate fertilizer used 30 kg P h^{-1}) as (P_2O_5 of 40%) that used only once before planting. The potassium fertilize used as Sulfate Potassium (K 40%) at branches stage (40 kg h^{-1}) (Mohammad, 2017). The characters measured in this study include green forage (kg h^{-1}) and dry forage (kg h^{-1}) thousand grain weight (g), grain yield (ton h^{-1}) biological yield (ton h^{-1}), harvest index and protein percentage in grains.

Results and Discussion

Green forage yield (kg h^{-1})

The results of green forage yield showed significant difference among the treatments in the average of green forage. The two cuts treatment showed highest average of yield was 1300 kg h^{-1} and this treatment showed significant difference compare to one cut treatment gave less average were 685 kg h^{-1} (table 1). The result for this refers to the repetitions of cutting causes more growing then more green forage yield. This results were similar to other studies (Yunis and Aziz, 2013; Jabbar and Al-Dulaimi, 2014; Al-Khulaifawi, 2016).

Dry forage yield (kg h^{-1})

It was obvious from results in table 1, the difference among treatments in the average of dry forage yield at two cuts treatment showed highest average of yield reached 0.2222 kg h^{-1}, which had significant difference form one cut treatment that gave less average of dry forage yield was 0.1296 kg h^{-1}. This result has similar with other studies results such as Yunis and Aziz (2013); Jabbar (2014) and Al-Dulaimi and Khulaifawi (2016) they refer to significant increasing of dry forage yield as a result to the repetition of cutting the forage yield under studying with comparing to one cut. And, this may be caused by significant increasing of greenfodder cutting repetition.

Thousand grain weight (g)

It was obvious from results in table 1, thousand grain weight trait showed the difference among cultivars. Wild Oat cultivar recorded highest average of grain weight. Which was not significantly differs from Carrolup cultivar recorded 31.59 g and 31.07 g, respectively. However, Genzania recorded less average was 27.56 g. This is maybe caused by few number of grains in spike so that leads to increase of build components and the weight according to compensation rules among the yield components. This goes with the results of Al-Nidawi (2011) and Al-Baiati (2015). It seems that the genotypes have differs in 1000 grains weight.

It was also obvious that cutting treatments were differ from each other as in table 1 of the average of 1000 grains weight whereas control treatment, non-cut, showed the highest average of thousand grains weight was 32.05 g which has significant difference from one cut and two cuts treatments that recorded less average were 27.88 g and 30.30 g, respectively. This depression of weight related to the depression of dimension of woof which was responsible for photosynthesis because of narrow space for leaves, which leads to less accumulation of chemical components in a grain, and the repeat cutting leads to exhaustion in nutrition materials and shorten yield growing up (Dunphy *et al*., 1982 and Essa, 1990).

Grain yield (ton ha^{-1})

It was obvious from results in table 1 the difference among the cultivars. The Wild Oat cultivar, which precedes others, that recorded highest average of grains yield reached to 2.202 (ton ha^{-1}). It has significant precedence from other cultivars. While, Genzania gave less average reached to 1.744 (ton ha^{-1}). This preceding may have related to 1000 grains weight of Wild Oat which reflected positively on the yield, this is in a side. From other side, the difference of responding among cultivars to weather environments during the age of growing up of spikes and this reflects on the weight of the yield.

The results of table 1 showed difference among cutting management. The non-cut treatment recorded highest average of grain yield was 2.267 (ton ha^{-1}). It had significant aced on other treatments (one cut and two-cuts) that they showed less average of yield reached to 1.028 (ton ha^{-1}) and 1. 644 (ton ha^{-1}) respectively. This may have caused by cutting leads to shorten the time for growing up of new spikes as well as it depressed the needed dimension of green area, which was responsible for photosynthesis that was necessary for made carbohydrates as source to the components of yield.

Biological yield (ton ha^{-1})

The results of table 1 showed difference among the cultivars. Carrolup recorded the highest average of yield was 7.45 (ton ha^{-1}). It had significant biological yield compare to other cultivars. While, Wild Oat cultivar gave highest average reached to 6.38 (ton ha^{-1}). These results closed to Al-Hassan and Weli (2012), Rablie *et al*. (2012), Gazal (2012) and Sahuki *et al*. (2013). They mentioned this difference of biological yield average caused by the genetic differences among cultivars. Also, it was obvious from results in table 1 the significant difference among cutting treatments that non cut treatment aced others which recorded as highest average was 9.31 (ton ha^{-1})

Table 1 : Effect cultivars and numbers of cuts times on yield components of oat cultivars.

Treatment	Green forage yield (kg h^{-1})	Dry forage yield (kg h^{-1})	Thousand grain weight (g)	Grain yield (ton ha^{-1})	Biological Yield (ton ha^{-1})	Harvest index	Protein percentage in grains (%)
Cultivars							
Carrolup	1022.	0.1833	31.07	1.993	7.45	29.21	15.356
Wild oat	933.	0.1722	31.59	2.202	6.38	35.11	14.733
Genzania	1022	0.1722	27.56	1.744	6.63	27.58	14.833
L.S.D. (0.05)	N.S	N.S	2.26	0.379	50.82	4.21	0.376
Cutting treatments							
No cut	—	—	32.05	2.267	9.31	24.82	15.111
Single Cut	685	0.1296	30.30	1.028	6.93	28.69	15.000
Two cuts	1300	0.2222	27.88	1.644	4.22	38.39	14.811
L.S.D (0.05)	536.2	0.0843	3.00	0.575	81.49	5.56	N.S

than one cut and two-cuts treatments recorded less average of yield reached to 6.93 ton ha^{-1} and 4.22 ton ha^{-1}, respectively. The result for this belongs to the long period of growing up which was responsible for increasing shoot system in comparing with period of plant that was cut for one or two times that shorten the period in comparing with non cut treatment.

Harvest index

It was obvious from results in table 1, there was a significant effect of cultivars in harvest index trait. Wild Oat aced than others which recorded as highest average of harvest index was 35.11% that had significant difference from other cultivars, Genzania and Carrolup, which recorded less average of this character reached to 27.58% and 29.21%, respectively. Wild Oat relates aced in grains yield and biological yield and this point may cause to high transferring photosynthesis qualification of this cultivar. This result goes to Al-Hassani (2014) who shows the variety of these cultivars because of its ability of transfer dry components to grains. Also, the rustles of table (1) showed difference among the cultivars in cutting treatments. Two cut treatment aced others that it recorded highest average of harvest index was 38.39% which has significant difference from non-cut and one cut treatments that record less average reach to 28.69% and 24.82%, respectively.

Protein Percentage in grains (%)

It was obvious from results in table 1 that there was significant effect of cultivars. Carrolup aced others which recorded highest average reached to 15.356% that had significant difference from Genzania and Wild Oat cultivars that record less average reach to 14.833% and 14.733%, respectively. This difference relates to the genetic differences among cultivars that reflect Carrolup difference in this character, protein percentage in grains, in addition to more carbohydrates vises less protein in these cultivars and it had less 1000 grains weight cause increase protein percentage so the go with Noworolink (2010), O'Denovan *et al*. (2011) and Shafi *et al*. (2011) they found significant difference among cultivars of this study in average of protein percentage.

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