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**FEED VALUE OF SUNFLOWER HEADS IN DIFFERENT VARIETIES**

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**ABSTRACT**

In this study, nutrient contents, cell wall fractions, in vitro OMD and ME values of the heads, which remains in the field post-harvest, of 4 different hybrid sunflower (*Helianthus annus* L.) varieties that are planted commonly in Thrace Region, are compared. According to the findings, OM, CP, EE, CF and CA with NDF, ADF, ADL and cellulose contents in dry matter of sunflower varieties were respectively determined between 80.18-84.47%, 6.50-11.04%, 2.56-3.74%, 15.38-18.16% and 15.53-19.82% with 25.46-30.15%, 27.09-36.51%, 10.90-18.05% and 10.39-23.04%. In vitro OMD and ME values with Ca and P contents of varieties are respectively detected between 61.89-66.60% and 9.55-10.46 MJ/ kg DM with 2.15-3.22% and 0.07-0.30%. It has been observed that different varieties of sunflower heads have equivalent quality in comparison with the average quality forage and has relatively better quality in terms of some dry forage, which is used in ruminant nutrition, both in terms of in vitro digestibilities and ME values. In conclusion, when the forage problem in our country is considered, it is predicted that using sunflower heads as alternative to forage source will contribute to both the enterprise and national economy.

**Keywords:** Sunflower head, nutrient contents, in vitro digestibility, metabolizable energy.

**Introduction**

Sunflower (*Helianthus annus* L.) production (1.680.700 tone/year) in Turkey, particularly in the regions of Thrace and Central Anatolia (TUIK, 2015). While sunflower meal are used as a good source of protein in livestock in our country, stems and heads are considered as fuel. In practice, it is observed that these tables are consumed by ruminants because of their aromatic taste and smell. However, studies on the feed value of sunflower plants are very limited. As a matter of fact, It is reported that daily weight gain is increased and fat utilization rate is improved (Sarıççek and Garipoğlu, 1997), milk yield and composition are not adversely affected (Rasool et al. 1998), milk fat is increased (Ngongoni et al. 2009), both dry and silage form can be used easily and ration cost is decreased (PARC, 1993; Amini-Jabalkandi et al. 2007; Özdüven et al. 2009). The aim of this study is to compare different varieties of sunflower heads in terms of nutritional value and to reveal their potential to be alternative roughage sources.

## MATERIALS AND METHODS

The materials of the study was to create a sunflower heads in 4 different varieties (Sanay MR, LG 5542 CL, LG 5580, Pioneer LL05/P64LL05) obtained from Tekirdağ-Hayrabolu region. Tables were ground in 1 mm screen, and the crude nutrients (Menke and Huss, 1975) (DM: dry matter, CA: crude ash, CP: crude protein, EE: ether extract, CF: crude fiber) Moreover, the organic matter (OM=DM-CA) and nitrogen free extract substances (NFE=OM-(CP+EE+CF)) of the heads were calculated from difference. The cellulose contents were calculated from ADF-ADL difference. The cellulose method (DeBoever et al. 1986) was used for *in vitro* OM digestibility (OMD) of the heads. Also the energy values of the heads according to this method were calculated. Analyses were conducted in two different days. In each day 4 replicates for each sample was studied. SPSS (SPSS version 18) package program (Multivariate Analysis of Variance) has been used in statistical evaluation of the data obtained from the study. In comparison of the differences between the mean values, Duncan multiple comparison test ( $P < 0.05$ ) has been used (SPSS, 2009).

## RESULTS AND DISCUSSION

The nutrient contents of the heads belonging to different varieties are given in Table 1, and the OMD and ME values are given in Table 2. According to the findings obtained, varietal difference significantly affected nutritive value, cell wall and mineral matter contents of sunflower heads ( $P < 0.05$ , Table 1). The highest OM, CP and EE contents (84.47%, 11.04%, 3.74%, respectively) in DM were found in the LG 5542, Pioneer LL05 and LG 5580, while the lowest CF content (15.38%) in the LG 5580 variants. This findings of OM content was considerably lower than the results of Sarıçiçek and Garipoğlu (1997), Rasool et al. (1998) and Ngongoni et al. (2007), whereas CP and EE contents were found higher. The findings of the CF content was suitable with results of Rasool et al. (1998), while it was found quite low from result (48%) of Sarıçiçek and Garipoğlu (1997).

**Table 1** Chemical composition of sunflower heads (in DM, %)

Varieties	Sanay MR	LG 5542	LG 5580	Pioneer LL05	P value
OM	80.18±0.05 <sup>c</sup>	84.47±0.09 <sup>a</sup>	82.40±0.12 <sup>d</sup>	83.93±0.08 <sup>b</sup>	0.00
CP	8.37±0.12 <sup>b</sup>	6.50±0.11 <sup>c</sup>	6.71±0.09 <sup>c</sup>	11.04±0.12 <sup>a</sup>	0.00
EE	2.56±0.04 <sup>c</sup>	3.24±0.06 <sup>b</sup>	3.74±0.08 <sup>a</sup>	3.31±0.07 <sup>b</sup>	0.00

<b>CF</b>	18.16±0.13 <sup>a</sup>	17.09±0.06 <sup>c</sup>	15.38±0.03 <sup>d</sup>	17.12±0.07 <sup>b</sup>	0.00
<b>NFE</b>	63.88±0.31 <sup>c</sup>	66.53±0.18 <sup>a</sup>	64.86±0.18 <sup>b</sup>	63.16±0.20 <sup>d</sup>	0.00
<b>CA</b>	19.82±0.05 <sup>a</sup>	15.53±0.10 <sup>d</sup>	17.60±0.12 <sup>b</sup>	16.07±0.08 <sup>c</sup>	0.00
<b>NDF</b>	30.15±0.21 <sup>a</sup>	27.41±0.17 <sup>b</sup>	25.46±0.10 <sup>c</sup>	29.18±0.06 <sup>a</sup>	0.00
<b>ADF</b>	33.94±0.27 <sup>b</sup>	30.70±0.19 <sup>c</sup>	27.09±0.11 <sup>d</sup>	36.51±0.27 <sup>a</sup>	0.00
<b>ADL</b>	10.90±0.11 <sup>d</sup>	15.54±0.13 <sup>c</sup>	16.70±0.10 <sup>b</sup>	18.05±0.10 <sup>a</sup>	0.00
<b>Cellulose</b>	23.04±0.25 <sup>a</sup>	16.16±0.25 <sup>c</sup>	10.39±0.39 <sup>d</sup>	18.46±0.31 <sup>b</sup>	0.00
<b>Ca</b>	3.22±0.23 <sup>a</sup>	2.38±0.08 <sup>b</sup>	2.40±0.04 <sup>b</sup>	2.15±0.20 <sup>b</sup>	0.01
<b>P</b>	0.12±0.00 <sup>c</sup>	0.07±0.00 <sup>d</sup>	0.20±0.00 <sup>b</sup>	0.30±0.00 <sup>a</sup>	0.00

The differences between means in the same row with different letters are important ( $P < 0.05$ ).

Because, the study of Sariçiçek and Garipoğlu (1997) also includes stem parts to the sunflower head. The CA contents of the heads varied between 15.53-19.82%, and the highest CA value and accordingly the content of Ca (3.22%) were determined at the Sanay MR type. The Ca contents of the heads were found to be higher than the values of Ngongoni et al. (2007) and (2009), and the P contents were found to be compatible except for the LG 5542 variety. ADF, ADL and cellulose contents were found to be high when the NDF contents of the heads were lower than the result of Ngongoni et al. (2007) (33.9%). This can be attributed to variations in the varieties, climate and soil conditions used in the studies. However, the ADF values of the heads are in accordance with the notion that NRC (2001) should have at least 21% ADF in dairy ration. Otherwise, the NDF contents of the heads are lower than the ADF. While there is no clear view that explains this situation, there are several possibilities related to the subject. The first is the possibility that the primer and secondary cell wall of the hybrid plants can be changed and formed at the same time (Cosgrove, 2005). The second is that the silica and pectin increased in the cell wall and did not dissolve in the ADF solution (Shewmaker et al. 1989; Van Soest et al. 1991). As a matter of fact, the silica in the periphery can dissolve 68% in the NDF solution, but 24% in the ADF solution (Shewmaker et al. 1989). Rasool et al. (1998) reported that the content of silica in sunflower stem and heads was higher than that of other roughages and similar to that of rice straw. As is known, silica is found on the cell wall and reduces the digestibility of the

feeds by a structure similar to lignin (Shewmaker et al. 1989; Van Soest and Jones, 1968). In this case, it is expected that the digestibility can be reduced in the varieties with high silica content.

**Table 2** *In vitro* OMD and ME values of sunflower heads (in DM, %)

	Sanay MR	LG 5542	LG 5580	Pioneer LL05	P value
OMD, %	61.89±0.42 <sup>c</sup>	66.60±0.60 <sup>a</sup>	64.91±0.22 <sup>b</sup>	65.46±0.56 <sup>b</sup>	0.00
ME, MJ/kg DM	9.55±0.14 <sup>d</sup>	10.30±0.07 <sup>a</sup>	10.46±0.02 <sup>a</sup>	10.22±0.06 <sup>a</sup>	0.00

The differences between means in the same row with different letters are important ( $P < 0.05$ ).

On the other hand, the variability difference significantly affected the *in vitro* OMD and ME values of the heads ( $P < 0.05$ , Table 2). The OMD values of the varieties ranged from 61.89 to 66.60%, with the highest value being found in the LG 5542 type. The OMD values of the heads are considerably higher than the values reported by Sariçiçek and Garipoğlu (1997) (46.2%). Because in the related study, the greater cellulose content, since included to stem to the sunflower head that were decreased digestibility. The ME values of the variants ranged from 9.55-10.46 MJ/kg DM and the highest values were obtained for the LG 5580, LG 5542, Pioneer LL05 variants, respectively. Although ME values of the heads are lower about 1 MJ than the value of Ngongoni et al. (2009), it can be close accept. The difference in energy value can be attributed to the inclusion of the seed part in the sunflower head in the study concerned. Both the digestibility and the energy value gave the lowest values of the Sanay MR type. This is related to the high CF and cell wall content of the structure. As a matter of fact, sunflower heads were found to be similar to medium quality roughage in terms of nutrients (Şayan et al. 2004; Kamalak et al. 2005).

## CONCLUSION

In conclusion, it can be seen that sunflower heads with different varieties are similar in terms of nutrient and cell wall contents to those of medium quality in terms of digestibility and energy value, in particular that milk cows can meet their requirements optimally. In this case, especially in the Thrace region where sunflower farming is intensive, it can be said that the heads left in the field after harvest may be an alternative to medium quality roughages in ruminant nutrition.

However, it is necessary to investigate these materials with hybrid structure in more detail, especially cell wall, silica and pectin, and to further improve the feed value in this direction.

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