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Effect of Previous Plant on Chemical Composition of Sweet Corn Grain

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Abstract: The aim of present study was to determine the effect of previous plant on the chemical composition of sweet corn produced as a second crop. The previous plant had a significant effect on the chemical composition of sweet corn grain. The crude protein content of sweet corn grain obtained after *Vicia sativa* plant was significantly ($p<0.001$) higher than that obtained after wheat plant. The crude protein content of sweet corn grain ranged from 13.23-14.02% of DM. On the other hand, NDF, EE and NFC contents of sweet corn grain obtained after *Vicia sativa* plant was significantly ($p<0.001$) lower than that obtained after wheat plant. However, the previous plant had no significant ($p>0.05$) effect on the cellulose and ADF contents of sweet corn grain. There is a significant relationship among nutrients contents of sweet corn grains. The CP and ash content were negatively correlated with NDF and ADF, whereas the CP and ash content were positively correlated with EE and NFC contents of sweet corn grain. On the other hand, NDF content was negatively correlated with EE and NFC of sweet corn grain. The EE content was positively correlated with NFC. The previous plant affected the chemical composition of sweet corn grain obtained as a second crop. The sweet corn plant should be sown after *Vicia sativa* to obtain sweet corn grain with high protein, ash and non-fibre carbohydrate contents.

Key words: Sweet corn grain, chemical composition, crude protein, neutral detergent fibre, acid detergent fibre, non-fibre carbohydrate

INTRODUCTION

Corn (*Zea mays* L.) plant is the most popular plant, which is grown in most parts of world for grain and other reason. However, there are several types of corn cultivated for the different reason. The sweet corn is one of the corn types. Over the last 10 years the production and consumption of sweet corn (*Zea mays* var. saccharata) have consistently increased since the growing season is of sufficient length, a second crop can be accommodated in Turkey. Generally, sweet corn grain is consumed as canned or frozen form. The sweet corn is also consumed on the cop after boiling in water. Although, Jones (1974) showed that previous plant may affect the grain yield of normal corn there is no available information related to the effect of previous plant on the chemical composition of sweet corn grain.

On the other hand, there is also some information on the agronomic characteristics of sweet corn (Esiyok *et al*., 2004; Esiyok and Bozokalfa, 2005) there is limited information about the chemical composition of sweet corn (Buyukerdem, 2005).

Therefore, the aim of this experiment was to determine the effect of previous plant on the chemical composition of sweet corn produced as a second crop.

MATERIALS AND METHODS

Sweet corn grain: A conventional sweet corn hybrid (Sun shine) was sown in triplicate plots in June 2008 with N (250 kg ha^{-1}) fertilization as a second crop after *Tritucum vulgare* and *Vicia sativa*.

The sweet corn ears were hand harvested in October 2008, when sweet corn attained the optimal maturity. The sweet corn ears were husked and dried in the laboratory of Kahrmanmaras Sutcu Imam University, Faculty of Agriculture, Department of Animal Science. After drying of samples the grain was separated and ground to pass through 1 mm sieve for subsequent analysis.

Chemical analysis: Dry matter content was determined by drying the samples at 105°C overnight and the ash by igniting the samples in a muffle furnace at 525°C for 8 h. Nitrogen (N) content was measured by the Kjeldahl

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method. The CP was calculated as N×6.25. NDF and ADF contents were determined using ANKOM fibre analyzer. Crude fibre and ether extract was determined by the method of AOAC (1990):

$$NFC = 100 - (NDF\% + CP + EE + ash)$$

Where:

NFC = Non Fibre Carbohydrate (%)
NDF = Neutral Detergent Fibre (%)
CP = Crude Protein (%)
EE = Ether Extract (%)

Statistical analysis: t-test was used to determine the effect of previous plant on the chemical composition of sweet corn grain.

As a complement of t-test procedure, a simple correlation analysis used to establish the relationship among nutrients contents of sweet corn grain.

RESULTS AND DISCUSSION

The effect of previous plant on the chemical composition of sweet corn grain is shown in Table 1. As can be shown from Table 1, the previous plant had a significant effect on the chemical composition of sweet corn grain. The crude protein content of sweet corn grain obtained after *Vicia sativa* plant was significantly ($p<0.001$) higher than that obtained after wheat plant. The crude protein content of sweet corn grain ranged from 13.23-14.02% of DM. This result is comparable with findings of Buyukerdem (2005), who suggested that the CP content of sweet corn grain was affected by the type of fertilizer and the CP of sweet corn grain ranged from 8.5-11.4% depending of fertilizer.

On the other hand, NDF, EE and NFC contents of sweet corn grain obtained after *Vicia sativa* plant was significantly ($p<0.001$) lower than that obtained after wheat plant. However, the previous plant had no significant ($p>0.05$) effect on the cellulose and ADF contents of sweet corn grain.

The chemical composition of sweet corn grain obtained in the present study was compared with the chemical composition of normal corn grain since there is no available information on the chemical composition of sweet corn grain in the study.

The NDF, ADF, EE and NFC contents of sweet corn grain obtained in the current study were comparable to those obtained by Benefield *et al.* (2006), whereas the CP contents of sweet corn grain obtained in the current study were considerably lower than those obtained by Benefield *et al.* (2006).

Table 1: Effect of previous plant on the chemical composition of sweet corn grain

Chemical constituents	Previous plant		Statistical parameters	
	Tritucum vulgare	*Vicia sativa*	SEM	Sig.
DM	89.64b	89.80a	0.037	*
Ash	1.66b	1.85a	0.018	***
CP	13.23b	14.02a	0.027	***
Cellulose	2.610	2.270	0.135	NS
NDF	16.43a	11.75b	0.390	***
ADF	4.410	4.320	0.350	NS
EE	7.39b	7.93a	0.069	**
NFC	72.84b	75.81a	0.363	***

a, b: Means values with common superscripts do not differ ($p>0.05$); DM: Dry Mater (%); CP: Crude Protein (%); NDF: Neutral Detergent Fibre (%); ADF: Acid Detergent Fibre (%); EE: Ether Extract (%); NFC: Non-Fibre Carbohydrate; SEM: Standard Error Mean; Sig.: Significance level; *$p<0.05$, **$p<0.01$, ***$p<0.001$; NS: Non-Significant at $p>0.05$

Table 2: Correlation coefficients (r) of the relationship among nutrient contents of sweet corn grain

Constituents	Ash	CP	Cellulose	NDF	ADF	EE
CP	0.967***					
Cellulose	-0.621^{NS}	-0.664^{NS}				
NDF	-0.901**	-0.956***	0.759^{NS}			
ADF	-0.126^{NS}	-0.094^{NS}	0.541^{NS}	0.224^{NS}		
EE	0.922***	0.917**	-0.674^{NS}	-0.950***	-0.366^{NS}	
NFC	0.853*	0.925**	-0.789^{NS}	-0.994***	-0.244^{NS}	0.925**

DM: Dry Mater (%); CP: Crude Protein (%); NDF: Neutral Detergent Fibre (%); ADF: Acid Detergent Fibre (%); EE: Ether Extract (%); NFC: Non-Fibre Carbohydrate; NS: Non-Significant at $p>0.05$; ***$p<0.001$, **$p<0.01$, *$p<0.05$

Correlation coefficients (r) of the relationship among nutrients contents of sweet corn grains is shown in Table 2. There is a significant relationship among nutrients contents of sweet corn grains.

As can be shown from Table 2, the CP and ash content were negatively correlated with NDF and ADF whereas, the CP and ash content were positively correlated with EE and NFC contents of sweet corn grain. On the other hand, NDF content was negatively correlated with EE and NFC of sweet corn grain. The EE content was positively correlated with NFC.

CONCLUSION

The previous plant affected the chemical composition of sweet corn grain obtained as a second crop. The sweet corn plant should be sown after *Vicia sativa* to obtain sweet corn grain with high protein, ash and non-fibre carbohydrate contents.

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