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Nutritional characteristics and *in vitro* digestibility of silages from different corn cultivars harvested at two cutting heights

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ABSTRACT - The objective of this study was to evaluate the nutritional traits and *in vitro* digestibility of silages from different corn cultivars harvested at two cutting heights. It was evaluated 11 cultivars (Dina 766, Dina 657, Dina 1000, P 3021, P 3041, C 805, C 333, AG 5011, FO 01, Dina co 9621 and BR 205) harvest 5 cm above ground (low) and 5 cm below the intersection of the first ear (high). It was used a random block design (three blocks), arranged in a 11 × 2 factorial scheme. Silages from plants harvested at high cutting height presented average content of dry matter significantly superior to silages from plants harvested at low height. Cultivars FO 01, AG 5011, Dina co 9621 and Dina 766 presented greater content of crude protein than cultivars C 805, P 3041 and P 3021, which presented the lowest contents of this nutrient. The raise in the cut height increased *in vitro* dry matter true digestibility coefficients and *in vitro* dry matter digestibility of silage evaluated. The increase in cut height improved nutritive value of silages by decreasing concentrations of fibrous fractions and increasing *in vitro* dry matter digestibility.

Key Words: chemical composition, corn cultivars, *in vitro* digestibility, silage

Características nutricionais e digestibilidade *in vitro* de silagens de diferentes cultivares de milho colhidos em duas alturas de corte

RESUMO - Objetivou-se neste estudo avaliar as características nutricionais e a digestibilidade *in vitro* de silagens de diferentes cultivares de milho colhidas em duas alturas de corte. Foram avaliadas 11 cultivares (Dina 766, Dina 657, Dina 1000, P 3021, P 3041, C 805, C 333, AG 5011, FO 01, Dina co 9621 e BR 205) colhidas 5 cm acima do solo (baixa) e 5 cm abaixo da inserção da primeira espiga (alta). O experimento foi delineado em blocos casualizados (três blocos), arranjados em esquema fatorial 11 × 2. As silagens das plantas colhidas na altura de corte alta apresentaram teor médio de matéria seca significativamente superior às silagens das plantas colhidas na altura de corte baixa. As cultivares FO 01, AG 5011, Dina co 9621 e Dina 766 apresentaram maior teor de proteína bruta, que as cultivares C 805, P 3041 e P 3021, as quais apresentaram os menores teores deste nutriente. A elevação da altura de corte aumentou os coeficientes de digestibilidade verdadeira in vitro da matéria seca e digestibilidade in vitro da matéria seca das silagens avaliadas. O aumento da altura de corte melhorou o valor nutritivo das silagens, diminuindo as concentrações das frações fibrosas e aumentando a digestibilidade *in vitro* da matéria seca.

Palavras-chave: composição bromatológica, cultivares de milho, digestibilidade *in vitro*, silagem

Introduction

The large number of cultivars available in the market, the good forage production, the easiness of tillage, and the mechanization are determinant factors for the use of corn for silage production. Choosing the adequate cultivar is one of the most important management decisions in a given animal production system because these cultivars vary in their nutritional characteristics (Bernard et al., 2004). Emphasis has been given to the dry matter yield per area and to the kernel production of the hybrids. Recently, studies are being conducted in order to enhance the cutting height at harvest, which implies in leaving a higher stalk proportion in the field, thus improving the silage nutritive value (Neylon & Kung, 2003).

Because the lower parts of the plant are considered less digestible (Tolera & Sundstøl, 1999), increasing the cutting height at harvest results in enhanced digestibility and

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improved animal performance. Wu & Roth (2005) gathered data from 11 studies utilizing corn silage harvested at two cutting heights, and observed that the high cutting height (50 cm) increased the crude protein and net energy levels, and the neutral detergent fiber digestibility, promoting an increase in milk production of dairy cows, per ton of silage produced, when compared to the usual cutting height (17 cm). Neumann et al. (2007b), evaluating the performance of confined Charolais steers, fed corn silages produced with different particle sizes and cutting heights, observed that when the plants were cut at 38.6 cm of height, the nutritive value of the silage improved and, consequently, the dry matter digestibility and animal performance also improved, when compared with a cutting height of 15.2 cm.

Moreover, variations in harvest conditions may influence the fermentation pattern during silage production (Neumann et al., 2007a), causing losses of nutritive value of the forage produced, which reduces animal performance, resulting in economic losses.

In this context, the objective of the present study was to evaluate the nutritional characteristics and the *in vitro* digestibility of silages from different corn cultivars harvested at two cutting heights.

Material and Methods

This study was conducted in the experimental area of the Fazenda de Ensino, Pesquisa e Produção da Faculdade de Ciências Agrárias e Veterinária (FCAV) – UNESP, Jaboticabal campus (21°15’22’’S and 48º18’58’’W), at an average altitude of 595 m.

Eleven corn cultivars (Dina 766, Dina 657, Dina 1000, P 3021, P 3041, C 805, C 333, AG 5011, FO 01, Dina co 9621 and BR 205) were evaluated at two cutting heights: low (5 cm above ground) and high (5 cm below the first ear insertion). The experiment was designed as randomized blocks (three blocks), in a 11 × 2 factorial arrangement (11 cultivars and two cutting heights).

The climate in the experimental area is a Cwa climate, according to the Köppen climate classification, which can be described as subtropical with a well defined dry season, during winter (from April to September), and a rainy season during summer (from October to March). The average annual precipitation was 1,400 mm, and the mean annual temperature was 22^{o}C. The soil was classified as typical eutroferric Red Latosol (Andreoli & Centurion, 1999), with a 0-20 cm layer of clay texture.

Soil was conventionally prepared with deep moldboard plowing (30 cm), followed by two harrow plowings immediately before sowing. Plots were composed by six 5-m long rows at 0.9-m row spacing, totalizing an area of 27 m^2. Ten seeds per meter, two by two, spaced by 20 cm in a row, were hand sown over fertilized furrows, with the aid of a jab planter. After emergence, the number of plants was reduced to five plants per linear meter, by manual thinning, in order to obtain a final population of 55,000 plants/ha.

Fertilization was carried out in two periods. At sowing, before planting, the fertilizer was placed in furrows, with a row planter regulated for 90 cm row spacing. At this time, 300 kg per hectare of the formula 4:30:16+Zn (3%) were utilized, totalizing 12 kg of N, 90 kg of P_2O_5, 48 kg of K_2O and 9 kg of Zn per hectare. The second fertilization, about 25 days after emergence of corn plants, utilized 150 kg urea per hectare (67.5 kg N per hectare). Then, 15 days after emergence, the presence of fall armyworms was controlled with 1.5 kg Sevin 850 PM per hectare. Plants were harvested 5 cm above ground and approximately 5 cm below the first ear insertion.

Plants were manually harvested and chopped in a JUMIL$^{®}$ stationary forage chopper. Harvest occurred when, by visual evaluation, the milk-line of the central ear kernels was at approximately 2/3 of the kernel, approximately 95 days after planting. The material was ensiled in 40 cm high and 10 cm in diameter experimental polyethylene bags, after being properly compacted to a density of 600 kg/cm³.

Percentage of dry matter (DM), crude protein (CP), ether extract (EE) and ashes were determined according to Silva & Queiroz (2002). Neutral detergent fiber (NDF), acid detergent fiber (ADF), nitrogen in acid detergent fiber (N-ADF) and nitrogen in neutral detergent fiber (N-NDF) were also determined (Van Soest, 1994). Ammonia nitrogen concentrations (N-NH3%/TN) were determined according to Cunniff (1995). Cellulose was determined by lignin oxidation with potassium permanganate, whereas lignin was considered as the difference between ADF and cellulose concentrations. Content of hemicellulose was obtained by the difference among contents of NDF and ADF.

No antifoam agent was used for the NDF and ADF determinations, and no sodium sulfite was used for the NDF determination. However, 0.2 mL of amylase PA (Ankom) was added to all samples.

Gross energy (GE) was determined with a semi-automatic Parr calorimetric bomb, model 1281.

Dry matter, CP, NDF and ADF *in vitro* digestibility (IVDMD, IVCPD, IVNDFD and IVADFD, respectively) in silage samples were determined by a digestibility assay in an Ankom$^{®}$ Ruminal Fermenter (“Daisy-II Fermenter”). For these analyses, 0.25 g of sample was weighed in F57 digestion bags previously washed in acetone, dried in air forced oven at 65°C and weighed. However, bags for obtainment of residues for CP determination received approximately 0.4 g of sample. After sealed, bags were put into the digestion recipient (25 bags each) with 1,600 ml pre-heated (39°C) buffer, which was composed by a 5:1 mixture of a solution A (10 g/L KH_2PO_4; 0.5 g/L $MgSO_4.7H_2O$; 0.5 g/L NaCl; 0.1 g/L $CaCl_2$ and 0.5 g/L urea-degree reactive) and a solution B (15 g/L Na_2CO_3 and 1.0 g/L $Na_2S.9H_2O$). After that, 400 mL of ruminal fluid inoculum was added into each recipient.

The ruminal fluid inoculum was obtained from a rumen cannulated Holstein steer which was adapted for 15 days in feedlot, receiving about 25 kg corn silage, 2 kg concentrate and water *ad libitum*. During the ruminal fluid collection period, the steer received the same diet.

Percentage of total digestible nutrients (TDN) was estimated according to the NRC (2001): %TDN = 0.98 (100-NDFn-CP-Ash-EE) + $e^{-0.012}$N-ADFCP + 2.25 (EE-1) + 0.75 (NDFn-Lignin) [1-(Lignin/NDF)$^{0.667}$]-7, where: NDFn = NDF-CP-NDF (% of DM) and CP-NDF = N-NDF 6.25 N-ADF = N-ADF/TN100.

Results were submitted to analysis of variance and means were compared by the Tukey test at 5% probability. Statistical analyses were realized in the SAS (1999) program, and all variables were tested for normality of residue. Blocks were used for local control.

Results and Discussion

Silage DM content differed between cultivars ($P<0.01$) (Caetano et al., 2011; Table 1). Differences in buffering capacity and soluble carbohydrates concentration, observed among cultivars, possibly resulted in different fermentation patterns and volatile fatty acids (VFA) production during ensiling, allowing a faster decrease in pH during the first days and, thus, reducing the DM loss of the considered cultivar (Caetano et al., 2011). Another possible explanation for the diverse DM content may be the DM concentration of the original forage that produced the silage, which altered fermentation pattern, soluble carbohydrates concentration, buffering capacity and epiphytic microbiota.

Cutting height also influenced the silage DM concentration ($P<0.01$). Silages from plants cut higher have higher ear proportion, compared to the vegetative fraction (leaf and stalk) and, therefore, have higher DM content. Such behavior was also observed by Beleze et al. (2003), who verified an increase in DM concentration, with the advance of corn hybrids maturity stage, which was positively correlated with ear and kernel percentage, and negatively correlated with leaf, stalk and leaf sheath percentage. Kung et al. (2008) evaluated two cutting heights and observed increased silage DM percentage (about 35%) when corn plants were cut high (45 cm above ground).

According to McDonald et al. (1991), silage from all the cultivars and the two cutting heights had DM percentage within the recommended range for silages with a good fermentation pattern (30 to 35% DM) inasmuch as plants ensiled with low DM levels produce large quantities of effluents, or slurry, which carry great amounts of nutrients, important to the bacteria which produce lactic

Table 1 - Chemical-bromathological composition of silages from the evaluated corn cultivars harvested at two cutting heights

Cultivar		Dry matter	Ash	Ether extract	Crude protein	Gross energy	pH	$N\text{-}NH_3$/Total nitrogen
		% DM						
Dina 766		33.21ab	3.79ab	3.16	8.58a	4.23	3.97	8.63
Dina 657		32.25abc	3.62ab	2.49	8.20abc	4.25	3.96	9.54
Dina 1000		29.07c	3.92a	2.73	8.27abc	4.24	4.06	8.89
P 3021		32.32abc	3.25ab	2.69	7.82bcd	4.22	3.92	9.57
P 3041		32.38abc	3.59ab	2.77	7.70cd	4.23	3.97	9.18
C 805		34.98a	2.91b	2.83	7.41d	4.21	3.92	9.34
C 333		33.32ab	3.22ab	2.73	8.56ab	4.23	3.99	9.83
AG 5011		29.43bc	3.61ab	2.54	8.88a	4.26	4.01	9.54
FO 01		29.49bc	3.62ab	2.50	8.89a	4.23	3.99	9.26
Dinaco 9621		31.72abc	3.07ab	2.71	8.69a	4.24	3.88	7.54
BR 205		30.35bc	3.84ab	2.45	8.21abc	4.20	3.93	9.31
Cutting height	Low	29.93b	3.95a	2.45b	8.27	4.20b	3.96	8.23b
	High	33.41a	3.08b	2.97a	8.32	4.27a	3.97	10.15a
Variation source					P			
Cultivar		0.0002	0.0145	0.2297	0.0001	0.6201	0.3486	0.7218
Cutting height		0.0001	0.0001	0.0001	0.3369	0.0001	0.4268	0.0001
Cultivar × Cutting height		0.2312	0.7493	0.8410	0.3976	0.6751	0.5846	0.4914
CV (%)		5.67	12.18	14.81	3.98	1.19	3.11	14.97

Means in a column followed by the same letters do not differ ($P>0.05$) by Tukey test. P = significance level; CV = coefficient of variation.

acid and to the ruminant that will consume the forage, out of the silo. On the other hand, plants with high levels of DM are difficult to be compacted and favor the occurrence of aerobic fermentation and fungi development, limiting the silage intake (McDonald et al., 1991).

The silage percentage of ashes differed among cultivars (P=0.014) and cutting height (P<0.01). Cultivar Dina 1000 presented higher ash levels only when compared with cultivar C 805. Silages from plants harvested at the high cutting height had lower ash levels than the ones cut low. This can be explained by the possible contribution of the stalk fraction from plants cut low. Considering the whole corn plant, silages from plants cut low had higher proportion of kernels, contributing to low ash concentration.

There was no cultivar effect on EE levels (P=0.229) of the silage. However, silages from plants cut high had greater EE concentration (2.97%), compared to silages from plants cut low (2.45%) (P<0.01). This result may be justified by the higher kernel proportion of the ensiled material, observed when plants are cut high and part of the stalk fraction is left in the field (Borstmann et al., 2006).

Cultivars FO 01, AG 5011, Dina co 9621 and Dina 766 produced silages with greater CP levels (P<0.01), compared to cultivars C 805, P 3041 and P 3021. This result was also observed by Almeida et al. (2003), who reported lower values in silages from those cultivars (6.59 and 7.80% for cultivars C805 and AG 5011, respectively). Cultivar AG 5011 produced a silage with 8.01% CP, similar to the value reported by Velho et al. (2007). On the other hand, when evaluating these same cultivars, Pereira et al. (1997) observed greater CP levels in silages from cultivar C805 (8.10%).

Probably, the observed variations in silage CP levels are associated to genetic characteristics inherent to each cultivar and to differences in organic acids production during fermentation, specially the butyric acid inasmuch as all silages were submitted to the same experimental conditions (McDonald et al., 1991).

There was no difference in GE values of silages from different cultivars (P=0.62). In turn, when plants were cut low, silages presented lower GE levels (4.20 Mcal/kg DM), than when plants were cut high (4.27 Mcal/kg DM; P<0.01) (Table 1). Probably, the cutting height effect is associated with the higher EE level of silages from plants cut high, which have higher kernel proportion and, consequently, higher starch proportion. There were no cultivar or cutting height effect on silage pH (P>0.05), which varied from 3.85 to 4.11, and it was within the ideal range for an adequate preservation (3.8 to 4.2), according to McDonald et al. (1991). However, the observed pH values were higher than those reported by Almeida Filho et al. (1999) and Velho et al. (2007).

The N-NH3/TN proportion of silages from plants cut low was almost the same as that one reported by Almeida Filho et al. (1999), who evaluated silages from nine corn cultivars and observed a N-NH3/TN of 8.38%. Elevating the cutting height, however, increased the silage N-NH3/TN percentage (P<0.05). In this way, apparently, fermentation during ensiling was more adequate when plants were cut low, compared to plants cut high.

There were no difference in NDF, hemicellulose and lignin levels among cultivars (P>0.05), though, these values were significantly higher in silages from plants cut low (Table 2).

Kennington et al. (2005) observed lower NDF (41,9%) and ADF (45.8%) levels in corn silages when plants were cut higher (61 cm), compared to plants cut near the ground. Neylon & Kung (2003) and Bernard et al. (2004) evaluated the effect of corn plants cutting height in diets for dairy cows and observed that the increase in cutting height enhanced the nutritive value, reducing NDF and ADF, and increasing starch concentrations. Kruczynska et al. (2001) also reported reduction of the fibrous fraction and increase of effective degradability of silages produced from plants cut at 50 cm, compared to the ones cut at 10 cm above ground.

There was interaction between cultivar and cutting height (P<0.01) on silage ADF and cellulose levels. Behavior of cultivars, when harvested at the low cutting height, was similar for ADF and cellulose content. The highest values were observed for cultivars FO 01 and Dina 1000 whereas the lowest values were observed for cultivars C 333 and C 805. In silages from plants harvested at the high cutting height, the highest ADF and cellulose values were observed for cultivars AG 5011 and Dina 657, and the lowest ones for cultivars P 3021 and Dina co 9621.

When the cutting height effect was evaluated for each cultivar, the response in the ADF and cellulose levels was identical, and there was no difference among silages from cultivars Dina 657, C 333 and AG 5011 (P<0.01). Silages from the other cultivars had ADF and cellulose levels significantly higher, when the corn plant was cut low. The higher concentration of fibrous components in plants harvested at the low cutting height can be attributed mostly to the effective participation of fibrous carbohydrates located in the stalk, which gives greater support to the plant. This hypothesis can be confirmed because when the plant was cut low, there was greater proportion of stalks in the ensiled material, confirming the results in Table 2.

The N-NDF levels did not differ among cultivars (P=0.123; Table 3). However, silages from plants harvested at the low cutting height had higher N-NDF levels than the ones from plants cut high (P<0.001).

There was interaction between cultivar and cutting height for N-ADF levels. Considering plants harvested at the low cutting height, cultivar P3041, as well as cultivar Dina 1000, showed elevated N-ADF levels, differing from cultivars Dina 657, Dina co 9621 and C 333, which presented the lowest values (P<0.01). Considering the high cutting height, there was no difference among cultivars in N-ADF concentration. The reduced N-NDF and N-ADF levels of the silages indicates that fermentation processes were adequate, in other words, the ensiled material did not overheat, which could determine the occurrence of Maillard reactions and, consequently, increase N-ADF levels (Van Soest, 1994). The N-ADF concentration, in relation to total nitrogen, regardless of cultivar and cutting height, are

Table 2 - Fibrous fraction composition of silages from eleven corn cultivars harvested at two cutting heights

Cultivar		Neutral detergent fiber	Acid detergent fiber		Hemicellullose	Cellulose		Lignin
			Low	High		Low	High	
					% na MS			
Dina 766		44.07a	28.80cdA	20.67fB	19.34	25.53bcdA	18.87deB	2.53
Dina 657		51.87a	30.65bcA	28.06abA	22.45	27.81abcA	25.31abA	2.84
Dina 1000		47.66a	32.22abA	24.32cdeB	19.39	28.05abA	21.44cdB	3.53
P 3021		45.99a	30.67bcA	20.36fB	21.48	26.42bcA	18.07eB	3.09
P 3041		44.39a	27.11deA	22.30defB	19.17	23.29deA	19.99cdeB	3.24
C 805		44.30a	26.64deA	20.71fB	20.55	22.61eA	19.04deB	2.90
C 333		43.86a	26.22eA	24.84cdA	18.15	22.93eA	22.28bcA	3.02
AG 5011		47.43a	30.24bcA	28.88aA	17.70	26.50bcA	25.84aA	3.48
FO 01		53.34a	34.51aA	25.93bcB	23.15	30.02aA	22.87abcB	3.76
Dinaco 9621		46.03a	28.98cdA	21.86efB	20.54	24.97cdeA	18.14eB	3.86
BR 205		50.13a	30.00cA	26.40bcB	21.93	26.74bcA	22.69bcB	3.49
Cuttinh height	Low	51.00a	29.55	21.45a	25.83	3.72a		
	High	42.83b	23.88	18.95b	21.17	2.72b		
Variarion source				P				
Cultivar		0.1590	0.0001	0.6203	0.0001	0.0670		
Cutting height		0.0001	0.0001	0.0343	0.0001	0.0001		
Cultivar × Cutting height		0.3309	0.0001	0.9354	0.0001	0.0595		
CV (%)		9.31	2.55	21.48	3.40	19.74		

Means followed by the same capital letters (line) and lower case letters (column) do not differ (P>0.05) by Tukey test; P=significance level; CV = coefficient of variation.

Table 3 - Nitrogen levels in fibrous fraction and TDN of silages from eleven corn cultivars harvested at two cutting heights

Cultivar		N-ADF/TN		N-NDF/TN	TDN (% DM)	
		Low	High		Low	High
Dina 766		5.35abA	4.66aA	12.45	65.47abcB	74.83aA
Dina 657		2.94bA	6.05aA	14.20	63.82bcB	71.22abcA
Dina 1000		7.95aA	5.38aA	15.00	64.68abcB	70.37abcdA
P 3021		6.93abA	4.47aA	12.69	65.78abcA	72.65abA
P 3041		8.25aA	6.58aA	13.35	65.23abcA	69.20bcdA
C 805		4.79abA	4.24aA	12.72	66.01abcA	70.25abcdA
C 333		4.15bA	5.50aA	11.05	67.82abA	67.60bcdA
AG 5011		5.29abA	6.59aA	11.31	65.92abcA	65.95dA
FO 01		6.96abA	4.94aA	14.67	62.60cA	66.20cdA
Dina co 9621		4.03bA	4.29aA	11.96	69.23aA	66.34cdA
BR 205		5.66abA	5.35aA	15.12	66.21abcA	68.88bcdA
Cuting height	Low	5.75		14.68a	65.71b	
	High	5.20		11.56b	69.41a	
Variation source				P		
Cultivar		0.0008		0.1234	0.0001	
Cutting height		0.1767		0.0001	0.0001	
Cultivar × Cutting height		0.0034		0.8744	0.0001	
CV (%)		18.64		19.03	2.40	

Means followed by the same capital letters (line) and lower case letters (column) do not differ (P>0.05) by Tukey test; P = significance level; CV = coefficient of variation.

within the normal range for forages (3 to 15%), according to Van Soest (1994). Moreover, values are lower than those proposed by Almeida et al. (2003) as the maximum accepted for silage (12%).

By considering plants harvested at the low cutting height, silage from cultivar Dina co 9621 presented the highest estimated TDN (69.23%) whereas cultivar FO 01 presented the lowest value (62.60%; $P<0.01$). Yet, for silages from plants cut high, cultivars Dina 766 and AG 5011 presented the greatest and the lowest estimated TDN, ,respectively. The greater amounts of starch, observed when plants are harvested at a higher cutting height, may have important implications in digestibility (Kennington et al., 2005). Together, these data show that, depending on the cultivar, the recommended cutting height may be different. This occurs because, as well as the EE level of the grain, filling capacity is inherent to genetic characteristics of the plants, thus increasing the TDN values. In similar ways, nitrogen and fibrous carbohydrates concentrations can be altered by grain filling capacity.

The elevation in cutting height increased silage IVDMD coefficients (Table 4). Paziani et al. (2009), studying agronomic and bromathological characteristics of corn hybrids for silage production, observed that corn plant digestibility depended mostly on stalk digestibility and on kernel related parameters. These authors reported that stalks are negatively correlated to kernel production at ensiling and mature stages. Higher stalk proportions directly interfere with digestibility because cell wall of this fraction thickens faster than in other plant fractions. This fact explains the greater DM digestibility observed in plants cut high, in which most of the stalks was left in the field. Zopollatto et al. (2009) observed that at the ensiling point, stalk and kernel are the major components in the composition of plants (34.0 to 35.6%, and 32.4 to 36.6%, respectively). In this study, as maturity stage advanced, the plants stalk fraction increased and, consequently, DM digestibility decreased.

The IVDMD coefficients of silages from plants harvested at the low cutting height (58.88 to 62.15%) were higher than those reported by Almeida Filho et al. (1999), when evaluating a group of nine cultivars (51.55 to 56.20%). On the other hand, the IVDMD coefficients reported by Almeida et al. (2003) for silages from cultivars C 805 (73.31%) and AG 5011 (72.87%) were higher than those observed in this study for the same cultivars, harvested at the low cutting height (68.06 and 66.26%, respectively).

The IVDMD and IVCPD coefficients of silages from plants cut high were higher, compared to plants cut low ($P<0.05$). However, this cutting height effect on IVNDFD and IVADFD coefficients was reversed. Plants cut low had greater silage IVNDFD, because of the higher hemicellulose concentration observed (Table 2) because hemicellulose represents the NDF component that most contributes to its digestibility. Likewise, plants cut low had higher silage IVADFD because of the higher cellulose concentration (Table 2) inasmuch as cellulose represents the fraction that most contributes to ADF digestibility.

Table 4 - True *in vitro* digestibility coefficients of silages from eleven corn cultivars harvested at two cutting heights

		True *in vitro* dry matter digestibility	*In vitro* dry matter digestibility	*In vitro* neutral detergent fiber digestibility	*In vitro* acid detergent fiber digestibility	*In vitro* crude protein digestibility
Cultivar				%		
	Dina 766	71.56	63.94	34.29	33.06	73.84
	Dina 657	68.65	61.34	38.61	37.24	73.98
	Dina 1000	66.71	59.29	29.68	30.14	71.63
	P 3021	66.86	60.84	26.78	21.54	73.95
	P 3041	67.83	60.86	26.87	22.29	72.86
	C 805	68.62	59.79	27.13	19.10	72.59
	C 333	68.15	61.19	27.54	26.57	72.65
	AG 5011	66.12	60.04	28.43	31.63	76.03
	FO 01	64.23	57.16	32.02	28.38	70.74
	Dina co 9621	68.14	61.56	29.86	25.31	73.14
	BR 205	65.59	58.56	30.97	27.85	69.68
CH	Low	66.72	58.88b	34.11a	32.19a	71.30b
	High	68.39	62.15a	25.89b	22.90b	74.37a
Variation source				P		
Cultivar		0.1854	0.3456	0.3650	0.0964	0.1152
Cutting height		0.1019	0.0025	0.0005	0.0005	0.0007
Cultivar × Cutting height		0.9346	0.8538	0.9553	0.8041	0.6631
CV (%)		5.16	6.00	25.60	30.63	3.66

Means in a column followed by the same letters do not differ ($P>0.05$) by Tukey test; P=significance level; CV = coefficient of variation.

Silages from plants cut high had higher IVCPD coefficient probably because of its elevated N-NH_3 levels.

Conclusions

By increasing corn plants cutting height at harvest, the nutritive value of silages is enhanced, reducing fibrous fractions concentration and increasing the *in vitro* dry matter digestibility as well as levels of TDN.

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