

## COMPARISON OF GRAIN FEED QUALITY OF DIFFERENT BROAD BEAN GENOTYPES

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### Abstract

The objective of the present study was to determine grain feed quality of different broad bean cultivars and lines. For this purpose, Eleven different cultivars and five lines (Emiralem, Hystal, Sorgun, Kitik 2003, Sakiz, Eresen 87, Sevil, Reina Mora, Filiz 99, Salkim, Luz De, Otonoto, Seher, EU 4446, Canakkale, Antalya, EU319) were used as the plant material. Experiments were conducted in randomized blocks design with three replications. Effects of genotypes on grain feed quality were found to be highly significant ( $P \leq 0.01$ )

Current findings revealed that crude oil content between 0.62 - 1.58%, crude ash content between 1.89 - 3.30%, crude protein content varied between 22.30 - 32.14%, acid detergent fiber (ADF) content between 7.45 - 14.94% and neutral detergent fiber (NDF) content between 16.08 - 28.05%. Seher, EU 4446, Canakkale, Antalya, Filiz 99 and Hystal were found to be prominent for high crude protein and crude oil, thus these genotypes were recommended for animal feeding.

Key words: broad bean, genotype, crude protein, ADF, NDF

## 1. INTRODUCTION

Legumes are used for livestock most of the time in feed rations because of high protein, energy, mineral and vitamin content of kernels (Lalles, 1993). They usually used in ruminant feed rations since ruminants are able to convert nitrogenous materials not existing in kernel proteins into microbial proteins (Christodoulou et al. 2005).

Broad bean can be used herbage, hay and grain for feeding to ruminants and green pod and grain for human nutrition (Peksen et al. 2006; Canbolat and Bayram, 2007). Broad bean is one of the oldest cultivated plants in Turkey (Karadavut et al. 2010). Broad bean grains are rich source of proteins, essential fatty acids, carbohydrates, fiber, minerals, and bioactive compounds (Canbolat and Bayram, 2007; Revilla, 2015). Researchers mostly focus on chemical composition of the feeds including the parameters of crude protein, crude ash, ADF, NDF and mineral contents (Kaplan et al. 2016). Broad bean cultivars exhibit a great variation in yield and quality traits (Micek et al. 2015; Kokten et al. 2021).

Objective of the present study was to determine the grain quality parameters of broad bean cultivars and lines as a quality feed source for livestock.

## 2. MATERIALS AND METHODS

A total of 16 different broad bean cultivars and lines (Emiralem, Histal, Sorgun, Kitik 2003, Sakiz, Eresen 87, Sevil, Reina Mora, Filiz 99, Salkim, Luz De Otonoto, Seher, EU 4446, Canakkale, Antalya, EU319) were used as the plant material of the study. All broad bean grain was obtained from Bingol University. Broad bean grain was dried in an oven at 70 °C at 48 hours. Broad bean samples were milled through 1 mm sieve and used for chemical analysis. Crude ash content of samples was determined by burning at 550 °C for 8 hours. Kjeldahl method was used to determine the nitrogen (N) content of dried broad bean samples (Buchi Kjel Master K-375). Crude protein was calculated by using the equation of  $N \times 6.25$  (AOAC 1990). NDF in accordance with Van Soest and Wine (1967) and ADF in accordance with Van Soest (1963) by using ANKOM 200 Fiber Analyzer (ANKOM Technology Corp. Fairport, NY, USA).

Analyses results were subjected to variance analysis with SAS (SAS Inst., 1999) software. Differences between mean values were tested by Duncan's multiple range test.

## 3. RESULTS AND DISCUSSIONS

Chemical composition of broad bean cultivars and lines grain are provided in Table 1. The difference between broad bean cultivars and lines with regard to chemical composition were found to be significant at 1% level for genotypes. Crude oil of broad bean genotypes varied between 0.62 - 1.58%. While the lowest crude oil was obtained from Salkım cultivar, the highest value was observed in EU319 genotype. While the lowest crude ash was obtained from Sakız cultivar (1.89%), the highest value was observed in Salkım cultivar (3.30%). The lowest crude protein content was observed in Luz de Otonoto cultivar with 22.30%. The highest crude protein content was seen in Histal with 32.14%. The ADF and NDF contents varied between 7.45 - 14.94% and 16.08 - 28.05% respectively. The lowest ADF and NDF content were obtained from Çanakkale genotype and EU319 genotype respectively. The high ADF and NDF content were obtained from Filiz 99 and Eresen 87 cultivars respectively.

Grains of broad bean is significantly affected by genotype, agricultural cultivars and climate conditions (Jasińska and Kotecki 1998; Kaplan and Kizilsimsek, 2012). Jasińska and Kotecki (1998) reported crude protein content in broad bean seed was determined more by genetic factors than by the ecological condition. High-protein grains are low-cost sources for livestock (Sadeghi et al. 2009). Tufatelli et al. (2012) reported feeding broad bean seeds in a lactation diet for cattle supports performance similar to cattle diet traditional soybean meal. Results were similar to the findings of Canbolat and Bayram (2007) and Micek et al. (2015).

Increasing ADF and NDF ratios reduce animal feed consumptions. It was also reported that high ADF and NDF ratios decreased digestible energy. Just because of significant effects on feed digestibility, low ADF and NDF ratios are desired in quality feeds (Bozkurt, 2011). Results were similar to the findings of Canbolat and Bayram (2007) and Micek et al. (2015).

Seed oil contents aren't stable and vary with the genetic factors ecological conditions and agricultural practices (Baydar, 2000). Seed oil is too important for energy. Crude ash is composed of unburnt portion of the dry biomass and is used as an indicator of mineral content of the feed (Gençtan, 1998). Minerals are not synthesized in animal body, so they should be supplied

externally. Mineral contents up to 5% is accepted as complying with the standards, but upper limit of the minerals may vary from feed to feed (Anonymous, 2011). Results were similar to the findings of Jasińska and Kotecki (1998), Canbolat and Bayram (2007) and Micek et al. (2015).

*Table 1. Chemical composition of broad bean cultivars and lines*

Genotypes	Crude Oil	Crude Ash	ADF	NDF	Crude protein
	(% dry matter)				
Sorgun	1.13 <sup>d-g</sup>	2.80 <sup>abc</sup>	14.42 <sup>a</sup>	19.97 <sup>g</sup>	29.66 <sup>bc</sup>
Kitik 2003	1.13 <sup>d-g</sup>	2.49 <sup>abc</sup>	13.58 <sup>ab</sup>	24.69 <sup>bcd</sup>	23.00 <sup>gh</sup>
Luz de Otonoto	0.93 <sup>g</sup>	3.19 <sup>a</sup>	7.85 <sup>ef</sup>	22.29 <sup>ef</sup>	22.30 <sup>h</sup>
Reina Mora	1.40 <sup>abc</sup>	2.69 <sup>abc</sup>	13.61 <sup>a</sup>	24.94 <sup>bc</sup>	28.69 <sup>cd</sup>
Salkım	0.62 <sup>g</sup>	3.30 <sup>a</sup>	13.24 <sup>ab</sup>	23.88 <sup>cde</sup>	27.17 <sup>de</sup>
Sevil	1.23 <sup>c-f</sup>	2.95 <sup>ab</sup>	11.57 <sup>bc</sup>	22.58 <sup>def</sup>	28.51 <sup>cd</sup>
Eresen 87	1.37 <sup>a-d</sup>	2.75 <sup>abc</sup>	13.79 <sup>a</sup>	28.05 <sup>a</sup>	24.58 <sup>fg</sup>
Sakız	1.07 <sup>efg</sup>	1.89 <sup>c</sup>	13.03 <sup>ab</sup>	26.56 <sup>ab</sup>	25.94 <sup>ef</sup>
Emiralem	1.28 <sup>b-e</sup>	2.34 <sup>abc</sup>	9.75 <sup>cde</sup>	22.01 <sup>efg</sup>	28.79 <sup>cd</sup>
Filiz 99	1.28 <sup>b-e</sup>	2.30 <sup>abc</sup>	14.94 <sup>a</sup>	25.67 <sup>bc</sup>	25.69 <sup>ef</sup>
Histal	1.02 <sup>fg</sup>	2.79 <sup>abc</sup>	8.92 <sup>def</sup>	17.69 <sup>h</sup>	32.14 <sup>a</sup>
Çanakkale	1.28 <sup>b-e</sup>	3.29 <sup>a</sup>	7.45 <sup>f</sup>	17.35 <sup>h</sup>	31.26 <sup>a</sup>
EU4446	1.05 <sup>efg</sup>	2.80 <sup>abc</sup>	9.89 <sup>cd</sup>	22.61 <sup>def</sup>	31.39 <sup>ab</sup>
Seher	1.52 <sup>ab</sup>	2.74 <sup>abc</sup>	9.56 <sup>cde</sup>	21.69 <sup>fg</sup>	28.52 <sup>cd</sup>
Antalya	1.27 <sup>b-f</sup>	2.75 <sup>abc</sup>	8.94 <sup>def</sup>	17.58 <sup>h</sup>	32.06 <sup>a</sup>
EU319	1.58 <sup>a</sup>	2.00 <sup>bc</sup>	9.30 <sup>def</sup>	16.08 <sup>h</sup>	31.44 <sup>ab</sup>

#### 4. CONCLUSION

Broad bean grains are a significant feed source for livestock. The broad bean genotypes investigated in present study quite well-results for ruminant. Entire genotypes can reliably be cultivated in different region for animal feeding.

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