EURASIAN JOURNAL OF AGRICULTURAL RESEARCH

Determining The Yield and Yield Components of Several Genotypes of Hungarian Vetch (*Vicia pannonica* Crantz) With Winter Sowing Under Siirt Ecological Conditions

Şahin EVİZ[1], Nizamettin TURAN[2*]

[1]*Republic of Turkey Ministry of Justice, Siirt Courthouse, Siirt / Turkey*
[2]*The University of Siirt, Faculty of Agriculture, Department of Field Crops, Siirt/Turkey*

**Corresponding Author: nturan49@gmail.com*

Abstract

The study aims to determine the yield and yield components of several lines and varieties of Hungarian Vetch with winter sowing under Siirt ecological conditions. The trials were conducted in the trial and demonstration area under the Department of Field Crops according to randomized complete block design with 3 replications. In this study, Hungarian vetch varieties (Anadolu Pembesi-2002, Ege Beyazı-79, Tarm Beyazı-98, Budak) and lines (Line-3, Line-10, Line-2109) were used.

The heights of the varieties used in this research ranged from 36.00 to 51.67 cm, the fresh hay yield from 6427 to 20427 kg ha^{-1}, the hay yield from 2224 to 3954 kg ha^{-1}, the number of sub-branches per plant from 2.00 to 3.67, the crude protein ratio from 22.12% to 27.23%, the crude protein yield from 584 to 986 kg ha^{-1}, the acid detergent fiber (ADF) ratio from 28.55% to 31.44%, and the neutral detergent fiber (NDF) ratio from 33.11% to 39.16%. Out of the sample cultivars, it is determined that the most acceptable varieties for either gender yield or hay quality are Anadolu Pembesi and Ege Beyazı.

Keywords: Winter sowing, Hungarian Vetch (*Vicia pannonica* Crantz), hay yield, yield components

INTRODUCTION

Hungarian Vetch (*Vicia pannonica* Crantz) is an annual forage legume species, a cool-season plant able to survive freezing without any damage even in tough winters and grow in high altitude conditions, as well as water-efficient and drought-tolerant. This can be grown as main crop or intercrop in almost any ecological and edaphic conditions in every region in our country (Acıkgoz, 1991).

Hungarian vetch with winter sowing in the province of Siirt where winters are not much severe will grow fast in spring and complete its development without much water. However, no growing is possible for its spring sowing without irrigation.

Roughage sources in our country are inadequate to meet our livestock's needs. The yield and quality of pasture grounds that are the most valuable forages have considerably reduced due to unseasonable and excessive grazing or something else. It is suggested that since range improvement is highly time-consuming, costly and laborsome, the most effective way is to enhance planting and production of forage in field agriculture in order to close the shortage of roughage in a short time (Tosun 1996).

For long years, the breeding and maintenance work of our meadow and pasture areas used in non-compliance with amenajman rules are also made insufficiently. Therefore, they are degrading day by day and the roughage shortage is getting wider. The plantation areas for forage crops have expanded by means of the state aids under livestock breeding subsidies but not up to the desired level. For this, it is necessary to increase supports and explain the

importance of forage to farmers. The production costs, particularly feed costs, are very high. The farm gate prices for milk and dairies are low. Major one of the most fundamental factors for operational profitability are lowering input costs and raising product quantities and prices. In order to have profitable livestock enterprises and satisfactorily animal products, roughage resources should be effectively utilized. The local farmer folks cannot produce forage plants at a sufficient level. The amount of quality roughage obtained from current forage production remains non-satisfactory, and therefore the shortage is at the highest level.

In a study on Hungarian vetch (Acar et al., 2009) in which row spaces were 15, 30, and 45 cm, seed numbers 6, 7.5, 9, 10.5 and 12 kg decare, it was reported the row space was 30 cm at optimum level in terms of seed and hay yield, the seed quantity 9 kg decare, and the hay quantity 4078 kg ha^{-1}. In the study on the forage feeding values of Hungarian vetch, common vetch and hairy vetch at different harvests, Turgut et al. 2006) stated that the crude protein ratios in earlier inflorescence ranged from 23.2% to 19.6% in common vetch, 24.1% to 17.9 % in Hungarian vetch, and 20.2% to 16.0 % in hairy vetch, and the NDF ratios from 35.9 % to 44.3 %, 43.9% to 54.0 %, and 37.0% to 42.7%, *respectively*. In the study of Akkopru et al. (2007) conducted with 20 cm and 40 cm row spaces and 5 seeds (100, 150, 200, 250, and 300 per sq meter) in Van ecological conditions, it was observed that the highest fresh hay yield was 8116 kg ha^{-1}, obtained from the pair of 40 cm and 300 seeds per sq meter. Yuksel et al. (2007) performed a study on Hungarian vetch in Isparta conditions to determine a number of morphological, biological and agricultural traits in the year 2006 and reported that randomly selected 10 plant species were observed and measured on 11 different days (March 17, March 24, March 31, April 7, April 14, April 21, April 28, May 5, May 19, and May 26) at one-week intervals during their vegetation, related to plant height, root length, branch number, leaf length, leaf number, leaflet number, leaflet length, leaflet width, plant weight, root weight, and hay ratio, and according to the study results, the plant height ranged from 5.0 cm to 74.6 cm and the branch number from 2.7 to 3.2 in Hungarian vetch within the period from the commencing sampling period to the forming time.

In the study made on several vetch cultivars, Tosun et al. (1991) used Menemen (hairy vetch) and Ege Beyazı (Hungarian vetch) whose plant heights were respectively 62 cm and 41 cm and fresh hay yield and hay yield were respectively 3290 kg ha^{-1} and 2200 kg ha^{-1}; Balabanlı (1992) used in the study on Hungarian vetch that the highest hay yield was 3488 kg ha^{-1} obtained from the parcel in the row spacing of 17.5 cm x 1 cm and with winter sowing; in the study that Bakoglu et al. (2004) conducted with 4 Hungarian vetch (*Vicia pannonica* Crantz) lines (5, 16, 23, and 28) and Ege Beyazı variety and determined that though seed yield and its several traits vary with line and variety, the fresh hay yield was 1635.81 kg, the hay yield 322.41 kg, and caly x yield 231.47 kg per decare, and the mean plant height 46.20 cm, the branch and sub-branch numbers were 2.50 and 2.15 respectively; Orak et al. (2005) conducted an adaptation study with 5 Hungarian vetch lines, 1 population, 1 variety (Ege Beyazı) at 3 locations in Thrace Region between 2002 and 2004, and the average plant height of line and variety ranged from 61.9 cm to 83.3 cm, the branch number of the plant 2.2 to 4.1, the fresh hay yield 8881 kg ha^{-1} to 16859 kg ha^{-1}, and the hay yield 2033 kg ha^{-1} to 4058 kg ha^{-1}; Suzer and Demirhan (2005) performed a study to identify the relevant several winter vetch cultivars and the mixture of vetch and grain, with the cultivars and varieties of Efes-79 (hairy fruit vetch), Menemen-79 (hairy vetch), Karaelçi (common vetch), husband vetch, Tarm Beyazı-98 (Hungarian vetch), Ege Beyazı-79 (Hungarian vetch) in Edirne ecological conditions for two years between the years of 2000 and 2003 and observed that with plain sowing, the fresh hay yield of Tarm Beyazı was 31150 kg ha^{-1} while the fresh hay yield of Ege Beyazı was 4040 kg ha^{-1}, and the mean plant height was 71 cm in Tarm Beyazı and 53 cm in Ege Beyazı. In 2003, in the study of Sahar (2006) with the aim of discovering appropriate vetch varieties in Van ecological conditions, Ege Beyazı-79 was used as Hungarian vetch

variety, and Efes-79 as vetch variety, and according to the study results, the plant height was 43.5 cm, the fresh hay yield 7340 kg ha^{-1}, dry matter yield 2168 kg ha^{-1}, the crude protein ratio 17.4%, and the crude protein yield 379 kg ha^{-1} for Hungarian vetch.

In another study to investigate several traits of 12 Hungarian vetch variety and lines at five different locations in Southern Anatolian Region from 2008 to 2009 and 2009 to 2010, Sayar (2011) found that according to two-year average results, the flowering day number ranged from 165.7 to 177.9 days, the fresh hay yield 2.462 kg decare to 3.133 kg decare, the hay yield 531.5 kg decare to 699.8 kg decare, the plant height 56.5 cm to 60.9, the branch length 71.0 cm to 79.1 cm, and the branch number 2.9 to 3.2. Unal et al. (2011) studied several phonological and morphological traits of 4 Hungarian vetch and a variety of its at Haymana and Ankara locations in the years of 2006-07 and 2007-08, and two-year average results revealed that the crude protein yield of variety and lines ranged from 16.9 to 22.8 kg decare, the crude protein ratio 21.5 to 23.2%, the plant height from 32.28 to 37.20 cm and the branch number 2.53 to 3.86 per plant. In a research conducted at the location of Ankara Field Crops Central Research Institute between the years of 2010 and 2011, Mutlu (2012) observed that the highest fresh hay yield was 52329 kg ha^{-1}, obtained from Seğmen-2002 variety in full flowering season and 36863 kg ha^{-1} from Tarm Beyazı-98 variety in half flowering season, and the highest hay yield was 8431 kg ha^{-1}, found on Seğmen-2002 variety and 36863 kg ha^{-1} on Tarm Beyazı-98 variety in full flowering season, and in the same period, the highest average point was 44375 kg ha^{-1} in fresh hay yield and 7563 kg ha^{-1} hay yield, and the highest crude protein ratio was 20.5% for Seğmen-2002 and 19.9% for Tarm Beyazı-98 in the earlier flowering, and the highest crude protein yield was 1535 kg ha^{-1}, obtained from Seğmen-2002 in full flowering season, and 1083 kg ha^{-1} from Tarm Beyazı-98 in half flowering. In the study made by Sayar et al. (2012) with 12 different genotypes of Hungarian vetch on the farming land at Village Çagıl in the town of Kiziltepe in Mardin between the years of 2009 and 2010, it was found that the fresh hay yield ranged from 12270 to 23360 kg ha^{-1}, the plant height from 44.90 to 54.33 cm, the hay yield 2950 to 5750 kg ha^{-1}, the branch number 2.23 to 3.06, and out of the genotypes of Hungarian vetch in Kiziltepe conditions, the highest fresh hay yield and hay yield was obtained from the varieties of Oguz-2002 and Anadolu Pembesi-2002. In a study conducted in Diyarbakir ecological conditions, for Ege Beyazı variety the mean plant height was 45.2 cm, the fresh hay yield 12690 kg ha^{-1}, the hay yield 2910 kg ha^{-1} (Basbag et al. 2001). In Kirşehir conditions, intercropping Hungarian vetch (*Vicia pannonica* Crantz) with Italian ryegrass (*Lolium multiflorum* L) were experimented in a study and the quality features including the ratios of crude protein, NDF, ADF and ADL and the LER values were studied. The values obtained ranged from 11.58 to 17.86%, 37.12 to 59.67%, 28.69 to 39.66%, 6.22 to 7.84% and 1.09 to 1.27%, *respectively.* The highest ratios was from Italian ryegrass with plain sowing while the highest fresh hay yield and hay yield were discovered on the mixture of Hungarian vetch (80%) and Italian ryegrass (20%). The lowest NDF and ADF ratios were obtained from Hungary vetch with plain sowing. According to the study results, as the portion of Hungary vetch in the mixtures was rising, the crude protein ratio was increasing and however the NDF and ADF ratios were decreasing. Consequently, the mixtures of Hungarian vetch (80%) and İtalian ryegrass (20%) was found to be superior than the cultivars and other mixtures with crude plantation in terms of yield and quality (Simsek, 2015). In the province of Siirt, there are plantation areas of pasture-meadow (124.000 ha) and forage (8.000 ha) (Anonymous, 2015a). It was estimated that the hay crop was 190.000 tons, 130.000 tons from pasture-meadow area and 60.000 tons from forage plantation area.

However, there are livestock including 23.000 cattle and 750.000 ovine (equivalent to 102.000 (BBHB)) in the province of Siirt (Anonymous, 2015a). The annual average quantity of roughage need for these animals is 370.000 tons while the shortage for forage crops is about 180.000 tons. The hay produced (190.000 tons) is sufficient only for 51% of livestock.

Therefore, it is necessary to raise the forage plantation portions in field agriculture in eliminating or diminishing the roughage shortage.

MATERIALS AND METHOD

Materials

This study was conducted in the trial and demonstration area under the Department of Field Crops in the Faculty of Agriculture at Siirt University in 2006. The materials used in the study were 4 Hungarian vetch ((*Vicia pannonica* Crantz) varieties (Tarm Beyazı-98, Anadolu Pembesi-2002, Ege Beyazı-79, and Budak) and 3 Hungarian vetch lines (Line-3, Line-10, and Line-2109).

Ecological Characteristics For The Research Field

Siirt province has a mostly continental climate. On its eastern and northern parts, winters are more severe and snowy, and on its southern and south-western parts, summers are hotter and arid while winters are mild climate. Mean precipitation quantity of the years of 2015 to 2016 is 833.6 mm, annual average rate of relative humidity is 51.2 %, and January is the highest month with 70.5 %. While long years average for temperature is 13.5 ^{0}C, the mean temperature of the trial crop season of 2015 to 2016 is 15.3 ^{0}C (Anonymous, 2016).

Table 1. The ecological data for the research field

	Temperature (°C)		**Precipitation (mm)**		**Relative Humidity (%)**	
Months	Long Years (1950-2015)	2015-2016	Long Years (1950-2015)	2015-2016	Long Years (1950-2015)	2015-2016
September	25.1	31.5	5.3	0.1	34.0	18.5
October	18.1	20.7	48.7	189.6	50.3	52.3
November	10.4	12.5	80.2	41.0	64.0	58.3
December	4.8	6.6	93.8	70.4	72.4	57.1
January	3.2	2.7	80.0	200.6	72.0	72.5
February	4.5	9.9	99.1	63.8	66.6	62.5
March	8.7	11.9	107.3	136.6	61.3	56.2
April	14.3	19.2	99.7	66.8	58.2	41.5
May	19.7	22.3	57.8	64.7	49.9	41.9
Average in total	13.5	15.3	666.6	833.6	56.4	51.2

For the trial season the total average values of temperature and precipitation are higher, and that of relative humidity lower than those for long years term, as can be seen in Table 1.

Soil Properties For The Research Field

A soil analysis was made with the soil specimens taken prior to sowing in the Laboratory of Science and Technology Research Center Directorate under the Siirt University, and a number of physical and chemical properties for the soil samples from the trial area were identified.

Table 2. A number of physical and chemical properties for the trial area (0 to 20 cm)*

Nature (%)			pH	Salt (EC) mmhos/cm	Lime ($CaCO_3$) (%)	Organic Matter (%)	Receivable Phosphor (P_2O_5) kg/da	Receivable Potasium (K_2O) kg/da
Clay	Silt	Sand						
51.32	41.64	7.04	6.87	602	0.64	0.90	1.67	114

*:The assays were done in the Laboratory under Science and Technology Application and Research Centre Directorate.

As can be understood in Table 2, the soil from the trial area is clay-sandy in nature, with little lime concent, low quantity of receivable phosphor, rich in potasium, and poor in organic matter.

RESULTS AND DISCUSSION

The F values and the significance levels of variance analysis results for Hungarian vetch varieties are presented in Table 3.

Table 3. The F values and significance levels of Hungarian vetch (*Vicia pannonica* Crantz) varieties and lines

V.K.	Plant height	Fresh hay yield	Hay yield	Sub-branch number	Crude protein ratio	Crude protein yield	ADF	NDF
$F_{var.}$	18.98**	5.42**	8.79**	5.16*	4.97*	4.09*	4.63*	10.08**

*: Significant at P<0.05; **: Significant at P<0.01

Plant height (cm) and fresh hay yield (kg ha^{-1})

According to the variance analysis of Hungarian vetch varieties and lines, there was a statistically significant difference between the varieties for plant height and fresh hay yield ($p \leq 0.001$) (see Table 3). The mean plant height is 42.38 cm; the highest value is 51.67 cm in the Budak variety, and the lowest value is 36.00 cm in the Anadolu Pembe variety. The mean fresh hay yield is 9203 kg ha^{-1}; the Anadolu pembe has the highest fresh hay yield (10427 kg ha^{-1}) and the lowest value is obtained from Line-3 (6427 kg ha^{-1}) (See Table 4).

Table 4. Duncan Test results and averages of plant height and fresh hay yield for Hungarian vetch varieties and lines

Plant height (cm)			Fresh hay yield (kg ha^{-1})		
Variety	Mean	Group**	Variety	Mean	Group**
Budak		a	Anadolu		a
	51.67		Pembesi	10427	
Ege Beyazı	47.33	a b	Ege Beyazı	9729	a
Line-10	41.67	b c	Line-2109	9666	a
Line-2109	41.00	c	Line-10	9646	a
Tarm Beyazı	41.00	c	Budak	9625	a
Line-3	38.00	c	Tarm Beyazı	8906	a b
Anadolu		c	Line-3		b
Pembesi	36.00			6427	
Total Average	42.38		Total Average	9203	

**: There is no significant difference between the values in the same letter group according to Duncan's 1% test.

The study results for plant height yield are lower than the values found by Süzer and Demirhan (2005) and Basbag et al. (2001) and higher than those by Unal et al. (2011) and equal to those by Yuksel et al. (2007) and Sayar et al.(2012).

The findings obtained for fresh hay yield are lower than the values by Mutlu (2012), Sayar et al. (2012), and Sayar (2011) and equal to those by Sahar (2006), Akkopru et al. (2007).

In Siirt conditions, acording to the trial study made with the row spacing (20 cm) using the 100 kg ha^{-1} seed, the lowest plant height was of Anadolu Pembesi variety despite other higher parameters. Based on other varieties and lines, it is observed that the germination rate is higher in the Anadolu Pembesi seeds, and therefore the plant number per decare is so big to cover the parcel area. Furthermore, the significant differences could be caused by ecological and edaphic properties in the trial field of study, low organic matter, plant number per decare, variety properties, excessive temperature, growing season, ecological factors, cultural processes, and genotypic properties.

Hay yield (kg ha^{-1}) and sub-branch number (per plant)

According to variance analysis results, there is a statistically significant difference between the varieties and lines for hay yield ($p \leq 0.01$) and sub-branch number ($p \leq 0.05$) (see Table 3). In the study, it was found that mean hay yield is 3257 kg ha^{-1} while the highest hay yield is 3954 kg ha^{-1} in the Anadolu Pembesi variety and however the lowest hay yield is 2224 kg ha^{-1} in Line-3.

Mean sub-branch number is 2.95 per plant. The highest sub-branch number is 3.67 per plant in Anadolu Pembesi and Line-3 while the lowest sub-branch number 2.00 per plant in the Budak variety (see Table 5).

Table 5. Duncan Test results and averages of hay yield and sub-branch number for Hungarian vetch varieties and lines

Hay yield (kg ha^{-1})			Sub-branch number (per plant)		
Variety	Mean	Group**	Variety	Mean	Group**
Anadolu		a	Anadolu		A
Pembesi	3954		Pembesi	3.67	
Budak	3667	a b	Hat-3	3.67	A
Ege Beyazı	3681	a b	Hat-10	3.33	a b
Hat-10	3243	a b	Ege Beyazı	3.00	a b
Hat-2109	2798	a b	Hat-2109	2.67	a b
Hat-3	2224	b c	Tarm Beyazı	2.33	a b
Tarm Beyazı	3235	c	Budak	2.00	B
Total Average	3257		Total Average	2.95	

**: There is no significant difference between the values in the same letter group according to Duncan's 1% test.

The study results for hay yield are higher than those by Tosun et al. (1991), Sahar (2006), and Balabanli (1992) and lower than those by Sayar et al. (2012), Mutlu (2012), Sayar (2011), Basbag et al. (2001), Suzer and Demirhan (2005), and Bakoglu et al. (2004) and equal to those by Orak et al. (2005).

The findings in the study for sub-branch number are lower than those by Orak et al. (2005) and higher than those by Bakoglu et al. (2004) and equal to those by Yuksel et al. (2007), Unal et al. (2011), and Sayar et al.(2012).

The lower yield and yield differences could be caused by such factors as ecological and edaphic properties in the trial field, low organic matter, plant number per decare, variety properties, and excessive temperature.

Crude protein ratio (%) ve crude protein yield (kg ha^{-1})

According to variance analysis results, there is a statistically significant difference between the varieties for crude protein ratio and crude protein yield ($p \leq 0/05$) (see Table 3). Average value of crude protein ratio is 25.07 %, and the highest crude protein ratio is 27.23% in Line-2109, and the lowest 22.12% in Anadolu Pembe. Mean crude protein yield is 810 kg ha^{-1}, and the highest crude protein yield is 956 kg ha^{-1} in the Ege Beyazı variety, and the lowest 584 kg ha^{-1} in Line-3 (see Tablo 6).

Table 6. Duncan Test results and averages of crude protein ratio and crude protein yield for Hungarian vetch varieties and lines

	Crude protein ratio (%)		**Crude protein yield (**kg ha^{-1}**)**		
Variety	Mean	Group**	Variety	Mean	Group**
Line-2109	27.23	a	Ege Beyazı	956	a
Line-3		a	Anadolu		a
	26.27		Pembesi	874	
Ege Beyazı	25.98	a b	Budak	861	a b
Tarm Beyazı	25.67	a b	Tarm Beyazı	829	a b
Line-10	24.66	a b	Line-10	796	a b
Budak	23.54	a b	Line-2109	772	a b
Anadolu		b	Line-3		b
Pembesi	22.12			584	
Total Average	25.07		Total Average	810	

**: There is no significant difference between the values in the same letter group according to Duncan's 1% test.

The study results for crude protein ratio are higher than those by Mutlu (2012), Sahar (2006), Unal et al. (2011), and Simsek (2015).

The findings for crude protein yield are lower than those by Mutlu (2012) and higher than those by Unal et al. (2011) and Sahar (2006).The researchers argued that crude protein yield is more realistic criterion for selection by yield than hay yield, and for nutritional value, the maximum crude protein yield per decare for forage plant is more significant than hay yield (Carpici, 2009). In this study, higher crude protein yield could not be achieved, and it is concluded that this might be caused by a number of factors, particularly insufficiency of organic matter in soil, ecological factors ve antigonistic effect among nutrient elements.

ADF (Acid Detergent Fiber) (%) ve NDF (Neutral Detergent Fiber) (%)

According to variance analysis results, the statistically significant difference is 5% for varieties and lines for ADF ratio and 1% for NDF ratio (see Table 3). Averages of ADF and NDF percentages are 30.02% and 35.85% respectively. The highest ADF and NDF ratio are respectively 31.44% ve 39.16 % in Anadolu pembesi, and the lowest 28.55% and 33.11% in Line-2109 (see Table 7).

Table 7. Duncan Test results and averages of ADF and NDF ratios for Hungarian vetch varieties and lines

ADF ratio (%)			NDF ratio (%)		
Variety	Mean	Group**	Variety	Mean	Group**
Anadolu Pembesi	31.44	A	Anadolu Pembesi	39.16	a
Tarm Beyazı	30.83	a b	Budak	38.02	a b
Ege Beyazı	30.74	a b	Ege Beyazı	36.83	a b c
Budak	30.27	a b	Tarm Beyazı	35.23	b c d
Line-3	29.38	a b	Line-3	34.94	b c d
Line-10	28.96	b	Line-10	33.64	c d
Line-2109	28.55	b	Line-2109	33.11	d
Total Average	30.02		Total Average	35.85	

**: There is no significant difference between the values in the same letter group according to Duncan's 1% test.

The study results for ADF ratio are lower than those by Mutlu (2012) and Simsek (2015) and however for NDF ratio lower than those by Mutlu (2012), Simsek (2015), and Turgut et al. (2006).

CONCLUSIONS

This study aims to determine the Hungarian vetch varieties for winter plantation in the Siirt ecological conditions, and as a conclusion, the results obtained reveal that there is statistically significant effect for fresh hay yield, hay yield, plant height, and NDF ratio ($p \leq 0.01$). Furthermore, it is found that there are significant differences for sub-branch number, crude protein ratio, crude protein yield, and ADF ratio ($p \leq 0.05$). According to the trial results, the plant height values are ranging from 36.00 cm to 51.67 cm, the fresh hay yield from 6427 to 10427 kg ha^{-1}, the hay yield from 2224 to 3954 kg ha^{-1}, sub-branch number from 2.00 to 3.67 per plant, the crude protein ratio 22.12% to 27.23 %, crude protein yield 584 to 956 kg ha^{-1}, ADF ratio 28.55% to 31.44% and NDF ratio 33.11% to 39.16 %. In this study the highest values are 10427 kg ha^{-1} for fresh hay yield, 3954 kg ha^{-1} for hay yield, 3.67 per plant for sub-branch number, 31.44% for ADF ratio, and 39.16 % for NDF ratio in the Anadolu Pembesi variety, 51.67cm for plant height in the Budak variety, 27.23 % for crude protein ratio in Line-2109, and 956 kg ha^{-1} for crude protein yield in the Ege Beyazı variety. In forage legumes including vetch, the difference between NDF and ADF ratios is desired to be around 10 %. In the present study, the average of NDF and ADF ratios ranges from 35.23% to 30.02%, and the highest ADF-NDF percentage from 39.16% to 31.44 %. The study results reveal that the Anadolu Pembesi variety for fresh hay yield, hay yield, sub-branch number, ADF ratio and NDF ratio, the Budak variety for plant height, Line-2019 for crude protein ratio, and the Ege Beyazı variety for crude protein yield are featured. When considering the yield and yield components of the varieties and lines according to the one-year studied parameters, the Anadolu Pembesi variety is more significant in the Siirt ecological and edaphic conditions. In order to more clearly determine the yield differences and nutritional values of the varieties studied, further studies can be conducted in a more

extensive way that they are cultivated as winter and summer crops and aftercrop at different locations in the Siirt province for at least two years.

In Turkey, the percentage of forage plantation areas was 2.5% to 3% in the 1990's and has recently become about 11 % by means of the state aids provided by the Ministry of Food, Agriculture and Livestock while that is 25% to 30% in developed countries (Anonymous, 2015b). In our country, despite the fact that the agricultural land is nearly 27 million ha, it is estimated that area of 5 million ha is fallowed (Anonymous, 1999). One way to increase the portion of forage plantation within the field crops is to cultivate the catch crops such one-year forage plants as vetch, field pea, grasspea in the fallowed lands. In addition, the state aids for forage crops should progressively continue. Certified seeds must be used to gain quality and high yield in forage production. Seed supply for farmers at a reasonable cost is required for sustainable cultivation of efficient and quality crops. Therefore, the seed prices should be kept low, and the selective supports raised to encourage the production and use of certified seeds. Additionally, the relevant institutions and agencies should provide for producers information utility about variety, harvest and cultivation techniques in forage plantation and promote and enhance forage production through demonstration works.

ACKNOWLEDGMENT

This work was supported by the Project of BAP / 2015-SİÜFEB-18 which is funded by Siirt University Scientific Research Project Unit. This article was presented at the International Conference on Agriculture, Forest, Food Sciences and Technologies Conference held in Cappadocia/Nevsehir on 02-05 April 2018 and published as a abstract proceeding book of ICAFOF Conference.

REFERENCES

Acar, Z., Ayan, İ., Gunaydın, G., 2009. Crop Rotation. Faculty of Agriculture, Ondokuz Mayıs University, Lesson Book Nr. 62, Samsun.

Acıkgoz, E., 1991. Forage Agriculture, Uludag University Publication, Bursa, 1991.

Akkopru, E., Sabancı, C.O., Ertus, M.M., 2007. Effect of Seed Quantity and Row Spacing Distance on Yield and Several Yield Characteristics in Hungarian Vetch (*Vicia pannonica* Crantz), VIIth Turkish Congress of Field Crops, 25-27 June 2007 Erzurum (Proceedings) s:235-238.

Anonymous, 1999. Agricultural Structure and Production. Turkish Statistical Institute Publications, Ankara.

Anonymous, 2015a. Governorship of Siirt, Database of Provincial Directorate, Ministry of Food, Agriculture and Livestock.

Anonymous, 2015b. Activities of Directorate General of Plant Production, Ministry of Food,Agriculture and Livestock, November 2014.http://www.tarim.gov.tr/sgb/Belgeler/SagMenuVeriler/ BUGEM.pdf (Accessed 05.02.2015).

Anonymous, 2016. Database of Siirt Directorate of Meteorological Station.

Bakoglu, A., Kokten, K., Karadavut, U., 2004. An Adaptation Study of Several Varieties and Lines of Hungarian Vetch (*Vicia pannonica* Crantz) in Bingol dry conditions. IIIth Symposium of Bingol.

Balabanli, C., 1992. Researches on the effects of different cultivation rates and times on the yield and yield components of Hungarian Vetch (*Vicia pannonica* Crantz), Doctoral thesis, p.70, Ankara.

Basbag, M., Saruhan, V., Gul, İ., 2001. An adaptation study of several annual forage legumes in Diyarbakir ecological conditions, IIth Turkish Field Crops Congress, 17-21 September 2001, Tekirdag, p. 169-173.

Carpıcı, B.E, 2009. Evaluation of Plant Density and Nitrogen Applications at different quantities in silage corn cultivation for stress physiology, Doctoral thesis. *Institute of Science, Uludag University*, Bursa, p.242.

Mutlu, Z., 2012.A Study on the effect of Crop Time on Hay Yield in Several Winter Vetches. Department of Field Crops, İnstitute of Science, Ankara University. Master Thesis.

Orak, A., Nizam, İ., Kamburoglu, İ., Gurcubuk, M., Moralar, E., 2005. A Study on the Adaptation of Several Hungarian Vetch (*Vicia pannonica* Crantz) Lines to Thracian Ecological Conditisons. VIth Turkish Field Crops Congress, 5-9 September, 2005, Vol.: II, 773-778, Antalya.

Sayar, S., 2011. Researches on determining genotype x environment interactions and stabilities of several Hungarian Vetch (*Vicia pannonica* Crantz.) varieties and lines by valuable agricultural traits in Diyarbakir ecological conditions. Doctoral Thesis, p., 271, Diyarbakir.

Sayar, M.S., Karahan, H., Han, Y., Tekdal, S., Basbag, M., 2012. Determining the Hay Yield of Several Hungarian Vetch (*Vicia pannonica* Crantz) Genotypes and its influencing characteristics, and their correlations in Kiziltepe ecological conditions Research Journal of Agricultural Sciences 5(2): 126-130, 2012 ISSN: 1308-3945, E-ISSN: 1308- 027X.

Suzer, S., Demirhan, F., 2005. Determination of the Winter annual forage plants (*Vicia* spp.) and their mixtures with cereal grains with high hay yield and adapted to Thracian conditions. VIth Turkish Field Crops Congress, Vol. II, p., 935-940, Antalya.

Sahar, A.K. 2006. A Study on the hay and seed yields of several vetch varieties and lines. Department of Field Crops, İnstitute of Science, Yuzuncu Yıl University, Master Thesis, p. 30, Van.

Simsek, S., 2015. Determining the effects of different mixture ratios of Hungarian Vetch (*Vicia pannonica* Crantz) and Italian ryegrass (Lolium multiflorum Lam.) on Yield and Quality. Department of Field Crops, İnstitute of Science, Faculty of Agriculture, Ahi Evran University. PYO-ZRT, 4003/2.13.005.

Tosun, M., Altinbas, M., Soya, H., 1991. Correlations between fresh hay and seed yields and some agronomic characteristics in several common vetch (*Vicia* sp.) species. IIth Turkish Congress for Meadow, Pasture and Forage Crops , 28-31 May 1991, İzmir, 574-583.

Tosun, F., 1996. Yesterday, today and tomorrow of forage plant breeding with meadow and pasture and in Turkey. IIIth Turkish Congress for Meadow, Pasture and Forage Crops, 17-19 June 1996, 1-15, Erzurum.

Turgut, L., Yanar, M., Kaya, A., 2006. The crude nutrient content of several vetch species harvested at different maturity stages and in situ rumen degradability. Journal of Faculty of Agriculture, Ataturk University, 37 (2), 181-186, Erzurum.

Unal, S., Mutlu, Z., Firincioglu, H.K., 2011. Performances of some winter Hungarian vetch accessions (*Vica pannonica* Crantz.) on the highlands of Turkey. Turkish Journal of Field Crops, 16(1); 1-8.

Yuksel, O., Balabanli, C., Karadogan, T., 2007. Monitoring the course of development in Hungarian vetch *(Vicia pannonica* Crantz.). VII. Turkish Field Crops Congress, 25-27 June, Erzurum, p. 239-243.