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Agricultural Properties of Some Lines and Varietes of Common Vetch from Bingöl (Eastern Anatoila)

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Abstract: With this study, yield and some agronomical characteristics of twenty one different common vetch lines (*Vicia sativa* L.) were investigated under dry conditions of Eastern Anatoila Region of Turkey during the 2014 growing season. Research was established as a randomized complete block experimental design with three replications. The results of variance analyzes showed that there were statistically significant differences among some characters (seed number per pod, P≤0.05); plant height, seed yield, crude ash, crude protein and NDF (Pd"0.01). In addition several quality traits; such as plant height, green herbage yield, dry herbage yield, pod number per plant, seed number per pod, seed yield, 1000 grain weight, crude ash ratio, crude protein ratio, neutral detergent fibre (NDF) and acid detergent fibre (ADF) were analyzed and important results were obtained.

Keywords: Agronomy; Bingol; Common Vetch; Morphology.

Introduction

The genus *Vicia* L. is in the Fabaceae (Leguminosae) family, comprises approximately 190 species in the world and 64 species in Turkey [1]. This genus is primarily located in the Mediterranean regions [2]. *Vicia* taxa are well adapted to winter growth in the Mediterranean environments throughout the world on a variety of soil types and are used in west Asia, North Africa, Australia, and Turkey for varied purposes such as dry matter, silage and green manure [3]. Common vetch (*Vicia sativa* L.) is one member of the *Vicia* genus and this plant is a more economically important annual legume crops and this plant has gained acceptance as a forage crop in Europe and other countries as it can be utilized as fodder, hay, green manure or seed production. As a legume crop, it fits well into cereal rotations, providing nitrogen to the soil and, if properly managed, it can reduce the incidence of diseases in succeeding non-legume crops [4,5].

Common vetch is an annual legume which is cultivated under rainfed conditions in the semi-arid regions of Turkey and other Mediterranean regions [6]. Because of the good adaption to adverse environmental conditions, common vetch has attracted much attention from breeders and producers, and thus has been cultivated as a grain legume for seed production in Asia, Africa and Europe [7]. Common vetch is commonly used forage in the Mediterranean basin and West Asia in rotation with winter cereal small grains, under rainfed conditions. This rotation facilitates the integration of small ruminants into agricultural systems as it contributes to meeting the structural forage deficit tline is linked to the seasonality of other feed sources. Feed legumes provide grazing in spring and early summer or hay, straw, and

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seed for the periods of forage deficit, such as winter [8]. In addition, common vetch possesses a large variation for plant morphology, maturity, length and thickness of stems, leaf width, pod setting, pod and seed size [9,10]. In several common vetch accessions, inheritances of several agronomic and morphological traits have been studied and their mean, minimum and maximum values have been determined [11]. 'Moreover, winter vetch has been used as human food since many years ago and planted to protect the soil, improve its structure and is used as green manure, dry forage, silage and green forage and forage of vetch is useful for livestock and its protein during the best harvest time is about 15-20 % [12]. Nutritional value of vetch is as much as alfalfa, but vetch is better because of no bloat in livestock, forage quality represents the nutritional value and energy content tline it transfers to livestock [13]. The most grown forage plant common vetch has been reformed more other species [14].

The aim of this study, to determine and compare yield and some agronomical characteristics of twenty one different common vetch lines and varieties from Bingol (Eastern Anatoila) conditions of Turkey. Common vetch has economically important properties, therefore the aim of this study also to provide yield and agronomical datas tline might be helpful in potential usefulness and economical significance of *Vicia* taxa growing in Turkey and Bingol conditions.

Materials and Methods

The study was conducted at the Agricultural Faculty, Bingöl University (38°53′55.86′′ N, 40°29′15.07′′ E, altitude 1166 m) in Bingöl (Turkey) province, during the growing season of 2014. Soil sample was collected at a depth of 0-20 cm. The soils texture is clay loam, available P_2O_5 327.5 kg ha-1 and available K_2O 1150 kg ha-1, quite weak in organic matter content (0.26 %), pH 6.85. Average temperatures of 12.2 and 21.5°C were recorded between April and July during growing season of 2014 and long-term averages in Bingöl, respectively. Avarage long-term total precipitations of 947.3 mm were recorded, 223.2 mm between April and July during the 2014 and long-term periods in Bingöl, respectively [15]. Six common vetch lines (Line-1, Line-2, Line-7, Line-8, Line-13, Line-17) and fifteen common vetch varieties (Dicle, Gorkem, Kral kizi, Alper, Soner, Selcuk, Cumhuriyet, Kubilay, Gap-61721, Gap-2604, Gap-2490, Gap-59998, Uludag, Ozveren, Alinoglu) were obtained from the Agricultural Faculties of Uludag, Atatürk and Çukurova Universities. ''Variety'' regard as cultivar species and ''line'' is usually a product of breeding that is not officially registered yet at a national level. Field experiments were designed according to randomized block design with three replications during 2014. Seeds were sown on the first of April, 2014 in Bingöl conditions. Plot size was 5 x 1.8 m. Sowing rate was 120 kg ha-1. 30 N kg ha-1 and 80 P_2O_5kg ha-1 were uniformly applied to soil before sowing. In trial parcels, 50 % vegetatif properties in bloom and generatif properties were detected in harvest maturity period; researches were donewith ten plants selected randomly from each parcel and as follows [16]. In this study; several hay quality traits such as plant height, green herbage yield, dry herbage yield, pod number per plant, seed number per pod, seed yield, 1000 grain weight, crude ash (CA) ratio, crude protein (CP) ratio, neutral detergent fibre (NDF) and acid detergent fibre (ADF) were analyzed. Agricultural properties were harvested 50 % flowering, acid detergent fiber and neutral detergent fibers in herbages were analyzed according to Van Soest et al. [17]. Ash content was determined by incinerating the samples in a muffle furnace at 550°C for 4 hour. Nitrogen contenting seeds was determined by the Kjeldahl procedure described by Nelson and Sommers [18], and crude protein content was calculated by multiplying the nitrogen content values by 6.25 DDM (Dry Matter Digestibility) [19]. The experimental design was completely randomized design with 3 replications. Data were analyzed by using the SAS packet program. The differences between means were separated by multiple range test of LSD ($p = 0.05$) [20].

Results and Discussion

As a result; plant height of the lines and varieties from 27.87 to 52.47 cm, green herbage yield 504.83 - 932.53 kg da-1, dry herbager yield 92.67 to 217.80 kg da-1, pod number per plant 5.57 to

15.77, seed number per pod 3.01 to 5.55, seed yield 9.73 to 44.73 kg da-1, 1000 seed weight 33.90 to 48.13 g, crude ash ratio 13.58-9.62 %, crude protein ratio 17.32-13.53 %, NDF 45.74-33.57 % and ADF 4.25-27.25 % were obtained. Dicle variety was determinate to the highest plant height, green yield and dry herbage yield. Others; pod number per plants, NDF and ADF (Kral kizi), seed number per pods (Gap-2604), grain yield (Selcuk), 1000 seed weight (Gap-2490), crude ash (Gap-59998), crude protein (Gorkem), respectively. Based on this study, Dicle and Kral kizi varieties were determined the best genotypes for Bingol and similar ecological regions. In a research indicated tline, plant height 60-88 cm, pod number per plant 6-12 piece, seed number per pod 4-5, dry straw weight 89-165 kg da-1and 1000 grain weight 37-51 g [21]. In another research contiuned with 15 common vetch lines which ICARDA origins; 1000 grain weight 26-75 g, seed yield 61-218 kg da-1 were determined [22] and , the average seed yield was 139.2 kg da-1 for 250.5 [23]. In Syria Mediterranean and central Asian origin in different *Vicia* varietes; plant height 16-65 cm, pod number per plant 4-80, seed number per pod 5-8 and 1000 seed weight 19-99 g were determined [24]. In dry conditions of Bingol in a study which carried out with 4 common vetch lines and 6 common vetch varietes with change according to line and varieties; average 792.2 kg da-1 wet grass, 220.1 kg/da dry grass and 78.0 kg da-1 seed yield, average plant height 22.4 cm, pod number per plant 4, seed number per pod 15.6 and ve 1000 grain weight 55.1 g were determined [25]. In another research, dry grass yield depending on common vetch lines and varietes 184-300 kgda-1, crude protein 5.1-15.4 %; ADF 28.1-31.2 %; NDF 37.4-48.1 %; crude ash 4.5-10.1 were detected [26]. In a work done in Serbia showed tline forage dry matter yield ranged from 800.0 kg da-1 to 1000.2 kg da -1 [27].

Varians analyzes results of plant height, wet grass, dry grass and pod number per plant of different common vetch varietes are seen in Table 1 (Graphics in Fig. 1); pod number per plant, seed yield and 1000 grain weight are seen in Table 2 (Graphics in Fig. 2) and crude ash, crude protein, ADF, NDF are seen in Table 3 (Graphics in Fig. 3). In examined line and varietes; plant height, seed yield, crude ash, crude protein and NDF percentages are statisticallyat 1 %; important results get in respect to dry grass and seed number per pod, despite tline wet grass yield, pod number per plant, 1000 grain weight and ADF values have been determined to be insignificant. As seen in Table 1, highest plant height with 52.47 cm obtained from Dicle variety, this is statistically followed by all varieties except the Kral Kizi who is in the same group. Lowest plant height with 52,47 cm obtained from Kral kizi variety. The average plant height of varietes was determined as 43.70 cm. The wetgrass yield values are ranged from 504.83 kgda-1 to 932.53 kgda-1. The lowest wet grass yield was obtained at Line-2 genotype with 504,83 kgda-1, the highest wet weed yield was obtained at 932.53 Dicle variety. The average dry grass yield was determined to be 172.25 kg da-1. While the highest pod number per plant was obtained with 15.77 from Kral kizi variety; the lowest pod number per plant was obtained from the Özveren variety with 5.57. As seen in Table 2, seed piece in plant with 74.67 from Kral kizi variety, and the number of seeds in the lowest plant was obtained from the Cumhuriyet type with 22.77 seeds. The average number of seeds per plant was 42.23. While the highest grain yield was obtained at Line-2 genotype with 44,73 kgda-1, the lowest grain yield was 5.63 kg da-1with Line-13 type and the average weight of a thousand grains was detected 39.92 g. Table 3 shows tline the highest crude ash content was obtained in the Gap-59998 genotype with 13.58 %, followed by the Kubilay type with 12.46 %. The lowest crude ash content was obtained from the Gap-61721 line at 9.62 %.The crude ash ratio of lines and varieties was 11.32 %. The highest crude protein ratio was observed in Görkem (17.32 %) and lowest Line-13 (16.41); ADF ratio was obtained for Kral kizi (34.75 %), Line-13 (27.25 %) and NDF was obtained respectively from Kral Kizi (45.74 %) and Dicle (30.61 %) varietes. Another study in same region CP concentrations for four varieties of common vetch were between 17.75 %-20.30, CA 10.20 %-12.64, ADF 28.14 %-32.91, NDF 40.76 %- 49.36 abtained to similar results [28], which are in agreement with the valuesreported in the

Table 1. Agricultural properties of the lines and varieties of common vetch

Agric. properties/ lines and varieties	Plant height (cm)	Green herbage yield (kg/da)	Dry herbage yield (kg/da)	Pod number per plant (number/plant)
Line-1	39.67A	628.20	184.77a	7.97
Line-2	43.27A	504.83	121.93a	7.57
Line-7	38.33A	610.07	159.70a	9.77
Line-8	40.77A	631.53	176.10a	13.33
Line-13	40.27A	579.87	142.30a	9.33
Line-17	50.00A	802.73	202.53a	8.23
Dicle	52.47A	932.53	217.80a	8.83
Görkem	46.73A	841.07	195.97a	13.33
Kralkizi	27.87B	412.63	92.67b	15.77
Alper	49.67A	713.97	160.73a	10.43
Soner	44.87A	630.53	189.50a	8.10
Selçuk	44.93A	736.10	171.63a	10.47
Cumhuriyet	44.33A	823.73	200.97a	8.23
Kubilay	49.67A	761.53	159.77a	6.13
Gap - 61721	46.00A	699.20	162.63a	9.00
Gap - 2604	42.60A	736.30	182.13a	6.43
Gap -2490	44.53A	729.40	201.17a	12.67
Gap -59998	38.73A	694.07	175.37a	11.43
Uludag	45.47A	807.87	180.26a	14.67
Özveren	44.93A	766.87	176.30a	5.57
Alinoglu	42.67A	714.62	162.97a	12.43
F value	4.016**	0.092	1.619*	0.810
Avarage	43.70	808.28	172.25	9.97

The averages indicated by the same letter are statistically not different from each other according to the Duncan test within the error limits of P≤0.01

* Marked F values are important at 5 % (P≤0.05)

** Marked F values are important at 1 % (P≤0.01)

literature [29].

The fact tline different vetch lines and varieties compared under the same environmental conditions do not change their plant characteristics is due to the genetic structure as well as climate and soil conditions [16]. When the climate data of Bingöl province are examined for many years and years of trial; it is observed tline the temperature is higher (21.5°C) and the amount of rainfall is considerably lower (223.2 mm) than the average of long years. It can be said tline this situation has a negative effect especially on plant growth and yield. Moreover, when the soil structure of the study area is examined, it may be affected by the proportion of organic matter is very low (0.26 %). Similar results were obtained in researvhes in different places on the common vetch [30-33].

Conclusion

The study was conducted at the Agricultural Faculty, Bingöl University (38°53′55.86′′ N, 40°29′15.07′′ E, altitude 1166 m) in Bingöl, during the growing season of 2014. Six common vetch lines and fifteen common vetch varieties were obtained. Several hay quality traits such as plant height, green herbage yield, dry herbage yield, pod number per plant, seed number per pod, seed yield, 1000 grain weight, crude ash (CA) ratio, crude

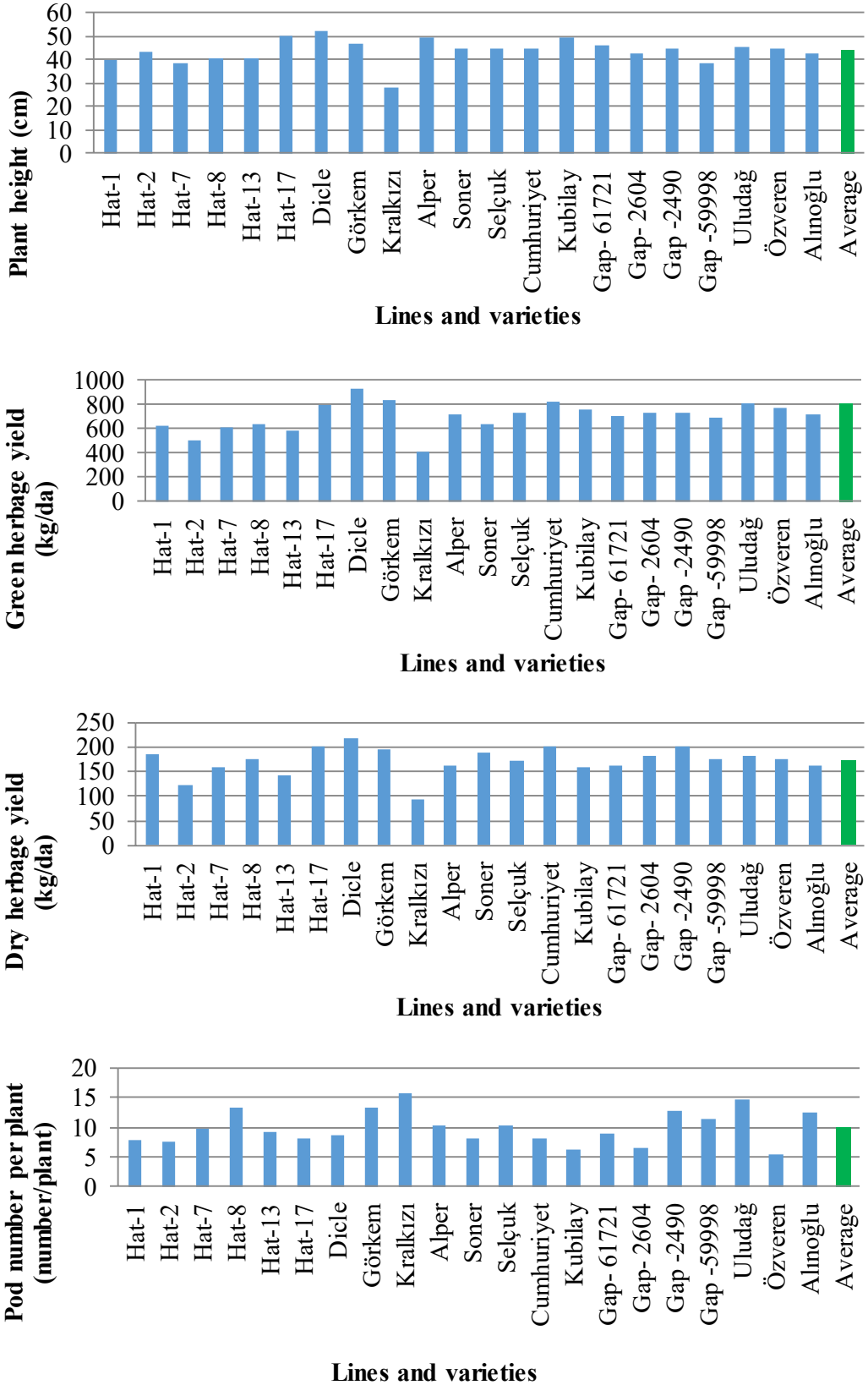

Fig. 1. Graphs related to average values of common vetch lines and varieties

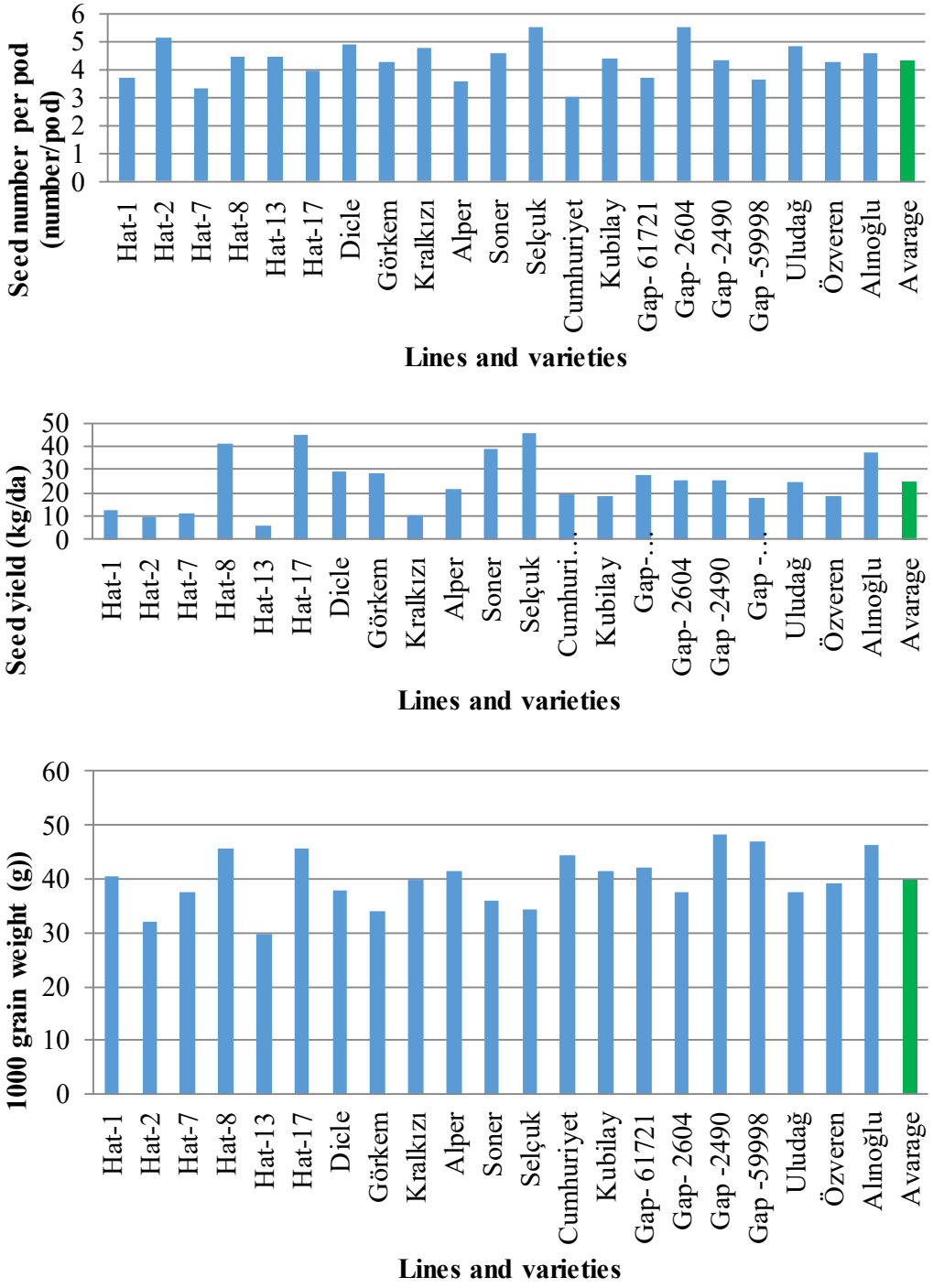

Fig. 2. Graphs related to average values of common vetch lines and varieties

protein (CP) ratio, neutral detergent fibre (NDF) and acid detergent fibre (ADF) were analyzed. Dicle variety was determinate to the highest plant height, green yield and dry herbage yield; Kral kizi: ADF and NDF respectively. In conclusion, Dicle and Kral kizi varieties were determined the best genotypes for Bingol and similar ecological regions.

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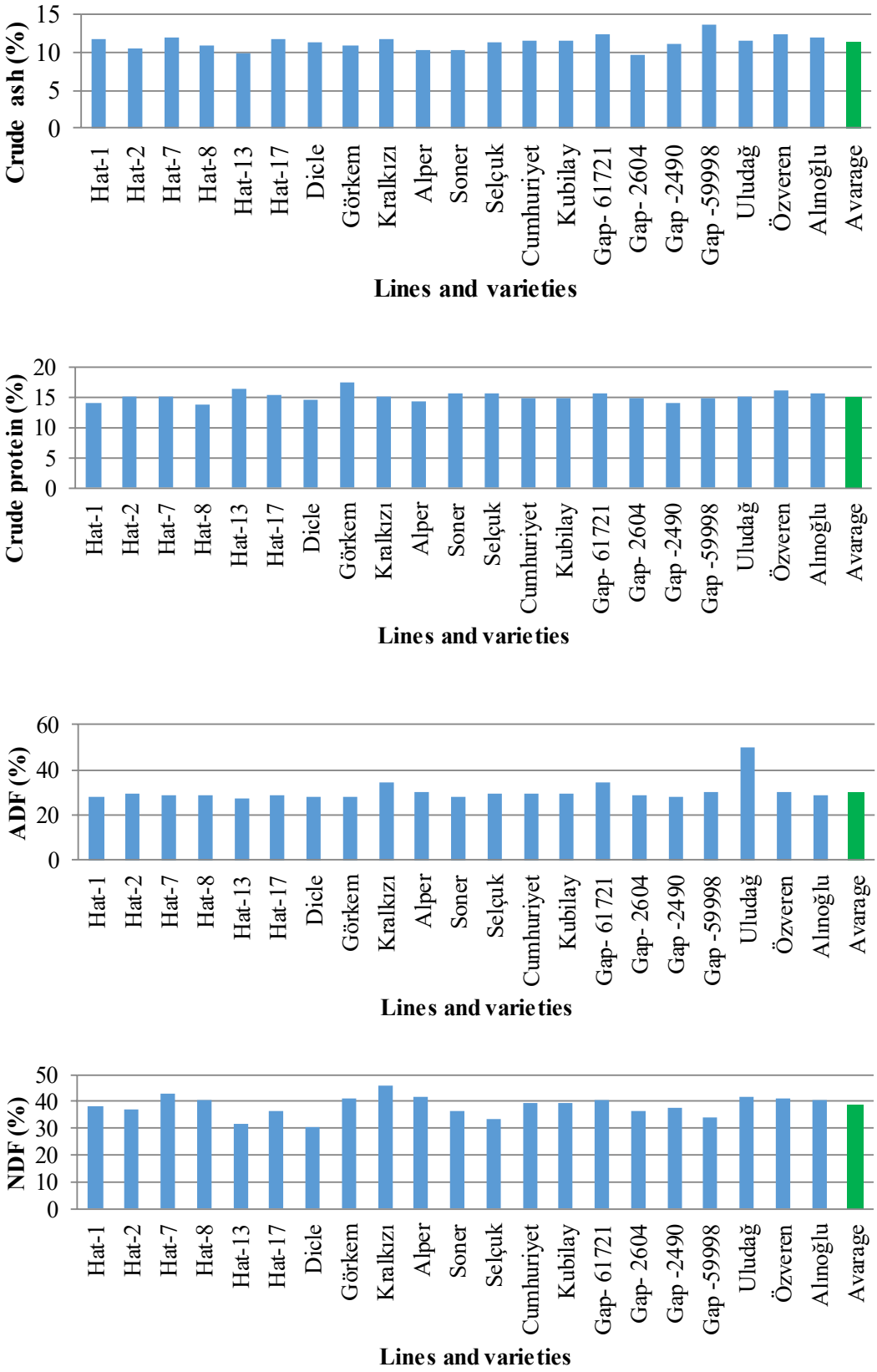

Fig. 3. Graphs related to average values of common vetch lines and varieties

Table 2. Agricultural properties of the lines and varieties of common vetch

Agric. properties / lines and varieties	Seed number per pod (number/pod)	Seed yield (kgda-1)	1000 grain weight (g)
Line-1	3.73ab	12.97C	40.60
Line-2	5.12ab	9.73C	32.03
Line-7	3.35ab	10.97C	37.53
Line-8	4.45ab	41.20A	45.60
Line-13	4.42ab	5.63C	29.90
Line-17	3.94ab	44.73A	45.60
Dicle	4.89ab	28.97AB	37.93
Görkem	4.28ab	28.10AB	33.90
Kralkizi	4.73ab	10.40AB	40.00
Alper	3.60ab	21.97AB	41.60
Soner	4.56ab	39.10B	35.80
Selçuk	5.48a	45.73A	34.43
Cumhuriyet	3.01b	19.73AB	44.30
Kubilay	4.39ab	18.63AB	41.37
Gap - 61721	3.71ab	27.87AB	42.27
Gap - 2604	5.51a	25.47AB	37.60
Gap - 2490	4.30ab	25.27AB	48.13
Gap - 59998	3.62ab	18.03AB	46.83
Uludag	4.83ab	24.53AB	37.57
Özveren	4.29ab	18.63AB	39.07
Alinoglu	4.55ab	37.07B	46.30
F value	2.259*	4.580**	1.780
Avarage	4.32	24.51	39.92

The averages indicated by the same letter are statistically not different from each other according to the Duncan test within the error limits of P≤0.01

* Marked F values are important at 5 % (P≤0.05)

** Marked F values are important at 1 % (P≤0.01)

Table 3. Chemical properties of the lines and varieties of common vetch

Agric. properties / lines and varieties	Crude ash (%)	Crude protein (%)	ADF (%)	NDF (%)
Line-1	11.67BC	13.89DE	27.73	38.24BC
Line-2	10.39BC	15.19BC	29.13	36.83CB
Line-7	12.06BC	15.05BC	28.52	43.25AB
Line-8	10.90BC	13.66DE	28.80	40.47AB
Line-13	9.82DC	16.41AB	27.25	31.82FG
Line-17	11.67BC	15.46AB	28.91	36.69CD
Dicle	11.38BC	14.44BC	28.28	30.61IG
Görkem	10.93BC	17.32A	28.07	41.26AB
Kralkizi	11.73BC	15.06BC	34.25	45.74A

table 3. (contined).

Agric. properties / lines and varieties	Crude ash (%)	Crude protein (%)	ADF (%)	NDF (%)
Alper	10.27CD	14.23CD	30.49	41.81AB
Soner	10.22CD	15.55AB	28.06	36.35CD
Selçuk	11.43BC	15.66AB	29.15	33.57EF
Cumhuriyet	11.54BC	14.93BC	29.34	39.38BC
Kubilay	12.46AB	15.48AB	34.17	40.45AB
Gap - 61721	9.62E	14.84BC	28.41	36.42CD
Gap - 2604	11.21BC	14.11CD	28.18	37.90BC
Gap - 2490	11.05BC	13.53E	28.10	40.45AB
Gap - 59998	13.58A	14.83BC	30.12	34.16DE
Uludag	11.63BC	15.12BC	29.73	41.49AB
Özveren	12.29AB	16.09AB	30.31	41.16AB
Alinoglu	11.94BC	15.54AB	28.67	40.65AB
F value	4.122**	2.412**	1.659	5.116**
Avarage	11.32	15.07	30.27	38.51

The averages indicated by the same letter are statistically not different from each other according to the Duncan test within the error limits of P≤0.01

* Marked F values are important at 5 % (P≤0.05)

** Marked F values are important at 1 % (P≤0.01)

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