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Evaluation of Some Grass Pea Genotypes (*Lathyrus sativus* L.) for Forage, Seed Yield and Its Components Under Rainfed Conditions in Sulaimani Region

ABSTRACT

A field experiment was conducted at the College of Agricultural Sciences Engineering/University of Sulaimani, during the winter season of 2016-2017 to study the evaluation of some grass pea genotypes for forage, seed yield and its components under rainfed conditions. A randomized complete block design (RCBD) with three replicates was used. Six genotypes of *Lathyrus sativus* L., one of these is local named (Marble) and the fifth other (IF1344, IF1953, IF1346, IF1332, and IF1347) obtained from ICARDA, were included in this study. Means comparison were carried out using least significant difference test (LSD) at 0.05 significant levels. The results showed that the effect of genotypes on forage yield characters was significant for the character's fresh forage yield and dry matter percent but the effects was not significant for the character dry forage yield. Marble (Local) genotype gave maximum yield of green forage, while genotype IF1953 recorded minimum green forage yield. But concerning dry matter percent, the highest value exhibited by IF1346 genotype, in which IF1332 gave the lowest value of dry matter. Concerning the effect of genotypes on forage yield components, which was significantly affected all characters with the exception of the character leaves/stem ratio was found to be not significant, IF1346 genotype recorded maximum values of plant height and dry leaf percent, while minimum value of plant height recorded by IF1332 genotype but minimum percent of dry leaf was exhibited by Marble genotype. Regarding the characters No. of branches.plant^{-1}, fresh stem percent and dry stem percent, Marble genotype gave the highest values for these traits, in which the lowest value of the trait No. of branches.plant^{-1} recorded by IF1346 genotype, but minimum values of fresh stem and dry stem percent exhibited by IF1347 genotype respectively. a cluster analysis results of all grass pea genotypes based on forage yield and its components, showed that there were two major (K= 2) groups for studied grass pea genotypes, the first group consist of five genotypes were (IF1344, IF1953 , IF1346,IF1332 and IF1347) and the second group was one genotype (Marble). But regarding seed yield and its components, the highest values of these traits (biological yield, pods number.m^{-2}, pod yield, and seed yield) were exhibited by genotype IF1344. Maximum values of (plant height, average of pod length and 100 seeds weight) acquired by genotype IF1332, on the other hand genotype IF1953 gave the highest values of (no. of branches. plant^{-1}, pods weight.plant^{-1} and seeds number.plant^{-1}), but concerning the both traits (pods number.plant^{-1} and seeds weight.plant^{-1}), maximum values were recorded by genotype IF1346. These results indicate the presence of variability between genotypes used in this study.

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INTRODUCTION:

Lathyrus is a large genus with 160 species. However, only a few species have an economic importance as food, feed and forage (Mihailovic et al., 2005). Grass pea (*Lathyrus sativus* L), is the most important species of lathyrus genus as a source of food (Biswas, 2007) with potential advantages such as drought tolerance, high protein content in seeds (Grela et al., 2012), higher pest and disease resistance (Talukdar and Biswas, 2008). *Lathyrus sativus* L. known as common chickling, is an annual cool season legume grown for both forage and seed yield (Mihailovic et al., 2006).

Lathyrus Sativus L. is sown for seed production as a source for human utilization, and also it is cultivated as a forage crop for animal feeds. Grass pea is one of the crops, which enrich in protein and starch content (Kumar et al. 2011) and Basaran et al., 2011). Additionally, it can be used for studies in plant breeding programs as it has an excellent resistance to many biotic and a biotic stresses (McCutchan, 2003).Nowadays, grass pea is the main crop among fabaceae family which is cultivated widely over the world (Arslan, 2017). Grass pea grows and develops very well in all soil types without expensive inputs due to its ability to enrich the soil by nitrogen fixation consequently it enters crop rotation systems (Basaran et al., 2011).

Grass pea supply nearly all organic nutrients and essential minerals to humans either directly or indirectly when plants are grazed by animals (Boukecha et al., 2017). The common use of legumes including grass pea makes this food group an important source of lipid, fatty acids, and protein in animal and human nutrition (Dixit et al., 2016). A large number of the scientific literature have shown the ability of legume to reduce the glycemic index and cholosterolomy which is due not only to the protective role of dietary fiber, but .haps also to the favorable content of fatty acids (Firincioglu et al., 2007). Many researches recommend that consumption of legumes should be increased for better health and management of chronic disease, as cardiovascular disease, diabetes, and cancer (Khandare et al., 2014). In dry regions grass pea is cultivated as a winter crop. Besides, it is reported that for hay purpose, cutting is better to be done at 50% flowering stage, and the foliage is air-dried, bailed and stored for winter feeding (Almeida et al., 2015). *Lathyrus sativus* L. is used as a green manure to ameliorate the soil properties. It increases the soil organic matter also to improve the soil structure. Besides, it increases the soil nutritive elements and to prevent the soil erosion. But the main objective is to rehabilitate the physical structure of the soil (Tadesse and Bekele, 2003).

Nutrient-dense food crops with reduced water demands such as Lathyrus are likely to play a key role in alleviating global malnutrition. However, to date, very limited research efforts have been devoted to improving Lathyrus. The main reason underlying this absence of research effort is the presence of a neurotoxin [β-N-oxalyl-l-α, β-diaminopropionic acid (ODAP)]. Consumption of it in a period of time will cause the neurological disorder lathyrism in humans and animals (Arslan, 2017; Bagci et al., 2004; Kokten et al., 2015 and Patto et al., 2006). The disease is more appeared when grass pea is the major component of the diet and accounts for at least 30% of caloric consumption for a period of three to four months (Hanbury, et al., 2000). Impacts of a genotype of factors on ODAP accumulation in Lathyrus, including plant growth stage, nutrients, a biotic stresses (drought, salinity and heavy metal) have been comprehensively studied by many agricultural institutions in the world (Kumar, et al., 2011).

The dry-matter yield of some grass pea and dwarf chichkling (*Lathyrus cicera* L.**)** lines were various. The mean dry-matter yield of the grass pea lines (1574 $kg.ha^{-1}$) was greater than that of the dwarf chickling lines (1229 $kg.ha^{-1}$). And, they suggested that the lines 311, 463 and 459 were promising for herbage production (Firincioglu et al., 2007). Adaptation of grass pea as an annual forage legumes was resulted 1948,6 $kg.ha^{-1}$ in dry-matter yield, whereas in seed yield possessed only 809,3 $kg.ha^{-1}$ (Talukdar, 2009) . Due to ecological and genetic differences, grass pea dry weight (DW) ranged from between 7.63 – 25.52 $g.plant^{-1}$ and, it was 9.92 $g.plant^{-1}$ as a general. Mikic et al. (2010) reported that DW varied 4.51- 8.18 $g.plant^{-1}$ in four French landrace of grass pea and also the mean of biological and seed yields were1370 and 1018 kg.ha^{-1} respectively. The authors concluded that grass pea was well adapted to the Aegean Region climatic and soil conditions and the breeding efforts should be directed especially towards its seed production (Basaran et al., 2011).Drought tolerance, low input requirement, high grain yield, nutritive value and pod shattering resistance nature of the grass pea genotypes makes it an ideal crop and hence preferred by farmers. Despite that, grass pea has still received little attention and landraces are rarely cultivated even today (Basaran et al., 2011)

The objective of this study is to evaluate some genotypes of *Lathyrus sativus* L. for forage and seed yield ability and to select the genotypes that are more adaptable to the region of Sulaimani.

MATERIALS AND METHODS:

A field experiment was conducted at the College of Agricultural Sciences Engineering/University of Sulaimani, during the winter season of 2016-2017 to study the evaluation of some grass pea genotypes (*Lathyrus sativus* L.) for forage yield and its components under rainfed condition. A randomized complete block design (RCBD) with three replicates was used. Six genotypes of *Lathyrus sativus* L., one of these is local named (Marble) and the other fifth (IF1344, IF1953, IF1346, IF1332, and IF1347) obtained from ICARDA, were included in this study. Sowing of crop was done on 25th January,2017, with the help of single row hand- drill at a seeding rate of 40 kg.ha^{-1}, one plot consist of 5 rows, and the length of each row was 2.0 m, at a planting distance of 30 cm between rows, the plot area was 3.0 m^{2} . Depending on soil analysis as shown in table(2) all plots were fertilized by recommended dose of DAP (18% N and 46% P_2O_5) was applied at sowing time at a rate of 30kg.ha^{-1}. All required agricultural practices were applied as needed.

Cutting the crop was done at 50% flowering stage for all genotypes on 30th April 2017 above (6-8 cm) from the soil surface to study the following forage yield characters and its components were:

Forage Yield Characters*:*

Green forage yield (kg.ha^{-1}), Dry forage yield (kgha^{-1}) and Dry matter percent.

Green forage weight (gm.m^{-2}) was taken for whole plots and converted to yield (ton.ha^{-1}). The sub samples (100gm) were died in oven at 65 ˚C for 72 hours to determine dry matter percent. Forage dry matter yield was recorded and converted in to dry matter production by using following formula (Khalil et al., 2011).

Dry yield (kg.ha^{-1}) = Dry yield in cut plot/ Plot area * 10000

Forage Yield Components:

Plant height (cm), number of branches. plant^{-1}(Average of five plants/plot), fresh and dry leaf percent, green and dry stem percent and ratio of leaves.stem^{-1}. Five plants were randomly selected in each plot to calculate preceded traits, the height of plants was measured from the ground level to the apex of main stem. The number of branches/plant was determined on the same five plants.

Another sub-sample was taken to separate leaf and stem to determine fresh and dry leaf and stem percent; leaves. stem^{-1} ratio was recorded by: weight of leaves, weight of stems^{-1}. When the crop matured physiologically, harvesting was done on 7th June 2017 for all plots were clipped previously to determine seed yield and its components.

Seed Yield Traits:

Biological yield biomass (above ground), pods number.m^{-2}, seed yield and pod yield was taken within each plot and converted in to ton.ha^{-1}. Straw yield was found by subtracting seed yield from biological yield.

Straw yield = Biological yield – Seed yield

Harvest index was calculated by dividing seed yield on biological yield.

Harvest Index = Seed yield (ton.ha^{-1}) / Biological yield (ton.ha^{-1})

Prior to harvest, five randomly plants were selected in each row to determine seed yield components as the average of five plants. Plant height was measured from the ground level to the apex of main stem. The number of branches. plant^{-1}, pods number. plant^{-1}, pod length, pods weight. plant^{-1}, seeds number. plant^{-1}, seeds weight. plant^{-1} and 100 seed weight was determined as the average on the same five plants.

Seed Yield Components*:*

Pods number.m^{-2}, Pod Yield (ton.ha^{-1}), Seed Yield (ton.ha^{-1}), Straw Yield (ton.ha^{-1}), Harvest Index, Plant Height (cm), No. of branches.plant^{-1}, Pods number.plant^{-1}, Average of Pod length (cm), Pods weight.plant^{-1} (gm), Seeds number.plant^{-1}, Seeds weight.plant^{-1} (gm) and 100 seed weight (gm)

Statistical Analysis*:*

All data were statistically analyzed according to the methods of analysis of variance as a general test conducted. Comparison among the means was carried out by using least significant test (L.S.D) at significant level of 5% (Muhammed, 2017).

Meteorological Data:

The meteorological data (Average air temperature and rainfall during the growing seasons of 2016-2017at Bakrajo Location) was shown in table (1) taken from Bakrajo Agro-meteorological station.

Table1. Average air temperature and rainfall during the growing seasons of 2016-2017 at Bakrajo Location

Months	**Average Air Temperature (°C)**		**Rainfall (mm)**
	Max.	**Min.**	
November	21.3	7.6	44.5
December	11.1	3.0	158.0
January	11.10	1.46	59.2
February	13.02	0.26	96.5
March	17.73	7.45	111.5
April	23.89	10.97	54.5
May	31.63	13.48	27.7
Total			551.9

Soil Analysis:

Sub samples were taken from the soil of experimental site to analyze some physical and chemical properties at Natural Resources Department in the College of Agricultural Engineering Sciences / University of Sulaimani as represented in table (2). Depending on the soil analysis the required fertilizers were applied.

Table (2) Some physical and chemical properties of soil analysis at experimental site

Soil Properties		Bakrajo location
P.S.D		Clay
Sand (g Kg^{-1})		41.00
Silt (g Kg^{-1})		430.50
Clay (g Kg^{-1})		528.50
E.C. (dS m^{-1})		0.61
pH		7.32
O.M (g Kg^{-1})		11.60
Total N (mg Kg^{-1})		1.07
Available Phosphate (mg Kg^{-1} Soil)		5.95
$CaCO_3$ (g Kg^{-1})		107.00
Soluble Cations and Anions (Mmole L^{-1})	Calcium (Ca^{+2})	0.39
	Potassium (K^{+})	0.12
	Sodium (Na^{+})	0.31
	Carbonate ($CO_3^{=}$)	0.00
	Bicarbonate ($HCO_3^{=}$	3.11
	Chloride (Cl^{-})	0.49
	Sulphate ($SO_4^{=}$)	0.77

Cluster Analysis:

The cluster analysis was conducted among genotypes to divide these genotypes to some groups and to know which genotypes close to the other according to quantitative traits as shown in figure (1).

RESULTS AND DISCUSSION

Effect of genotypes on forage yield characters of grass pea

Data in table (3) and appendix (1) showed that the effect of genotypes on forage yield characters was significant for all characters with the exception of the character dry forage yield which was found to be not significant, Marble (Local) genotype gave maximum yield of green forage (14.028) $ton.ha^{-1}$, while genotype IF1953 recorded minimum green forage yield (7.988) $ton.ha^{-1}$. But concerning dry matter percent, maximum percent was 18.039% produced by genotype IF1346, while genotype IF1332 gave minimum percent of dry matter which was 14.678%. The differences among grass pea genotypes may be due to their differences in relative performance of each genotype regarding to the character green forage yield. This result was agreed with the results of (Larbi et al., 2010). Also Firincioglu et al., (2007) suggested that the lines 311, 463 and 459 of grass pea were promising for herbage production.

Table (3) Effect of genotypes on forage yield characters of grass pea

Genotypes	Green forage yield (ton.ha^{-1})	Dry forage yield (ton.ha^{-1})	Dry matter %
IF1344	8.080	1.259	14.876
IF1953	7.988	1.365	15.789
IF1346	8.446	1.522	18.039
IF1332	11.247	1.625	14.678
IF1347	10.137	1.525	15.031
Marble (Local)	14.028	2.075	14.775
LSD $_{(p \leq 0.05)}$	3.871144	N.S	2.15727

N.S: Non significant

Effect of genotypes on forage yield components of grass pea

Data represents in table (4) and appendix (2) explains the effect of genotypes on forage yield components characters which was significantly affected all characters with the exception of the character leaves/stem ratio was found to be not significant. IF1346 genotype recorded the maximum values of Plant height and Dry leaf percent were 53.253 cm and13.409% respectively, while minimum value of plant height (39.497) cm recorded by IF1332 genotype but minimum percent of dry leaf (9.680%) exhibited by Marble genotype. Regarding the characters No. of branches.plant^{-1}, fresh stem percent and dry stem percent, Marble genotype gave the highest values with (11.777, 42.497% and 5.087%) respectively, in which the lowest value of the trait No. of branches.plant^{-1} (6.973) recorded by IF1346 genotype, but minimum values of fresh stem and dry stem percent (29.757% and 3.632%) exhibited by IF1347 genotype respectively. The differences between genotypes in forage yield components may be positively and strongly related to the differences in genetic map and these adaptations to the climate. These results were in agreement with the results reported by (Larbi et al., 2010) and (Muhammed, 2017).

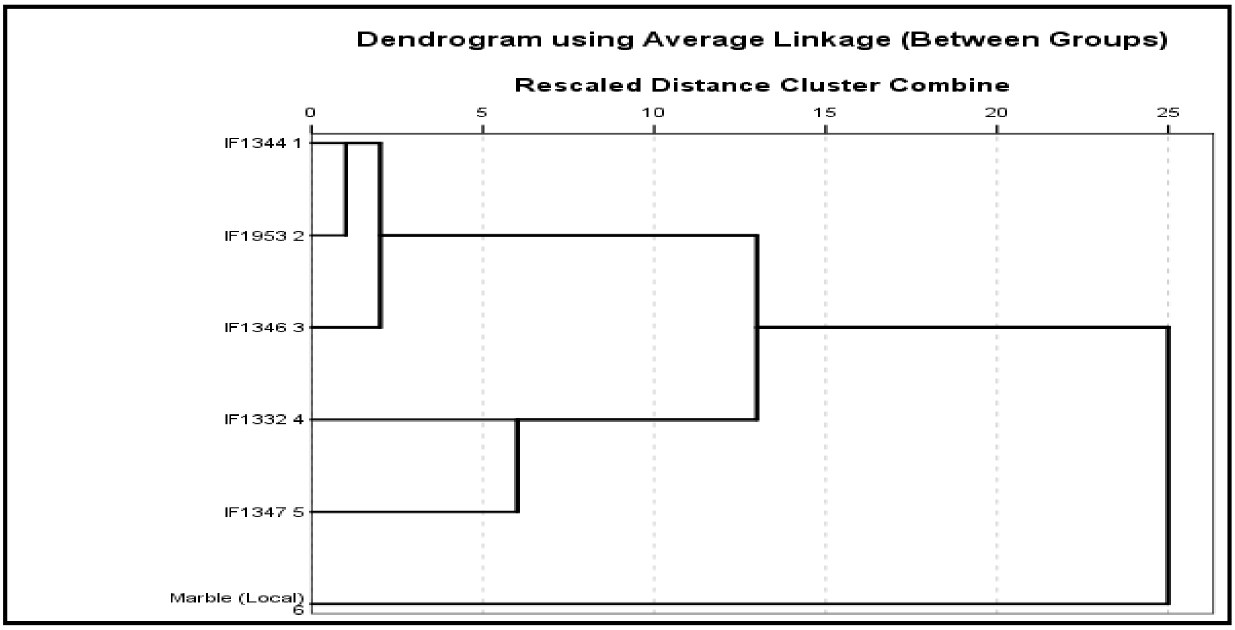
Table (4) Effect of genotypes on forage yield components of grass pea

Genotypes	Plant height (cm)	No. of Branches. plant^{-1}	Fresh leaf %	Fresh stem %	Dry leaf %	Dry stem %	Leaves/Stem ratio
IF1344	42.797	9.520	66.930	33.070	11.205	4.338	2.034
IF1953	50.053	10.553	65.730	34.270	11.069	4.719	1.919
IF1346	53.253	6.973	68.907	31.093	13.409	4.630	2.236
IF1332	39.497	11.000	67.797	32.203	10.613	4.006	2.109
IF1347	44.687	9.330	70.243	29.757	11.514	3.632	2.113
Marble (Local)	49.487	11.777	57.503	42.497	9.680	5.087	1.376
LSD $_{(p \leq 0.05)}$	5.938197	2.794586	5.088241	5.088241	2.13483	0.61746	N.S

N.S: Non significant

Figure (1) shows cluster analysis results of all grass pea genotypes based on forage yield and its components. The result showed that there were two major (K=2) groups for studied grass pea genotypes, the first group consist of two sub groups, the first sub group had three genotypes were (IF1344, IF1953 and IF1346) and the second sub group had two genotypes (IF1332 and IF1347). Then the second group was one genotype (Marble). These results indicate the presence of variability between genotypes used in this study.

Figure (1) Dendrogram of six grass pea genotypes based on cluster analysis of forage yield and its components



Effect of genotypes on yield traits of grass pea

Results of table (5) and appendix (3) revealed that the effect of genotypes on all yield traits was significant except the both traits straw yield and harvest index was not significant. The highest values of these traits (biological yield, pods number.m-2, pod yield, and seed yield) were (1.457 ton.ha-1, 260.533, 0.690 ton.ha-1, and 0.413 ton.ha-1) respectively exhibited by genotype IF1344, while the lowest values of (biological yield, pod yield, and seed yield) were (0.687, 0.253 and 0.180) ton.ha-1 respectively which was obtained by genotype IF1346, but regarding the pods number.m-2, minimum value was 109.433 recorded by local genotype marble. The superiority of this genotype IF1344 in biological and seed yield may be due to its adaptation in compare to other genotype which was well adapted to the Sulaimani region climatic and soil conditions which shown in table(1) and table (2) . This result agrees with the results of (Talukdar, 2009).

Table 5: Effect of genotypes on yield traits of grass pea

Genotypes	Biological Yield (ton.ha^{-1})	Pods number .m^{-2}	Pod Yield (ton.ha^{-1})	Seeds Yield (ton.ha^{-1})	Straw Yield (ton.ha^{-1})	Harvest Index
IF1344	1.457	260.533	0.690	0.413	1.044	0.293
IF1953	0.910	207.733	0.493	0.363	0.547	0.457
IF1346	0.687	116.600	0.253	0.180	0.507	0.263
IF1332	1.260	168.877	0.487	0.380	0.880	0.330
IF1347	1.097	146.633	0.357	0.287	0.810	0.260
Marble (Local)	1.100	109.433	0.290	0.200	0.902	0.183
LSD $_{(p\leq0.05)}$	0.4509	81.0547	0.1301	0.1234	N.S	N.S

N.S: Non significant

Data represented in table (6) and appendix (4) confirmed that the effect of genotypes on all seed yield components were significant. Maximum values of (plant height, average of pod length and 100 seeds weight) acquired by genotype IF1332 were (57.33 cm, 3.20 cm and 11.35 gm) respectively, on the other hand genotype IF1953 gave the highest values of (no. of branches.plant-1, pods weight.plant-1 and seeds number.plant-1) were (10.44, 14.65 gm and 108.67) respectively, but concerning the both traits (pods number.plant-1 and seeds weight. plant-1), maximum values were

(11.99 and 6.88 gm) exhibited by genotype IF1346 respectively. While minimum values of plant height and 100 seeds weight were 39.55 cm and 7.52 gm showed by genotype IF1344 respectively, while local genotype (marble) awarded the lowest (no. of branches.plant-1, average of pod length and seeds weight. plant-1) were (6.88, 2.63 cm and 1.85 gm) respectively. But regarding these both traits (pods number.plant-1 and pods weight.plant-1), the lowest values were (6.42 and 7.72gm) recorded by genotype IF1332 respectively, and IF1347 genotype gave minimum seeds number/plant which was 47.11. These differences among genotypes may be due to genetic variance and capability of each genotype for best production. These results were in agreement with the results of (Arslan, 2017).

Table (6) Effect of genotypes on yield components of grass pea

Genotypes	Plant height (cm)	No. of Branches. plant^{-1}	Pods number. plant^{-1}	Average of Pod Length (cm)	Pods weight. plant^{-1} (gm)	Seeds number. Plant^{-1}	Seeds Weight. Plant^{-1} (gm)	100 Seeds weight (gm)
IF1344	39.55	7.20	11.11	3.03	9.33	76.68	6.86	7.52
IF1953	39.83	10.44	11.44	3.03	14.65	108.67	6.02	8.60
IF1346	42.22	7.77	11.99	2.78	12.34	93.33	6.88	7.73
IF1332	57.33	7.37	6.42	3.20	7.72	55.00	5.12	11.35
IF1347	46.22	7.77	8.64	3.00	11.02	47.11	3.74	8.00
Marble (Local)	40.00	6.88	8.33	2.63	11.16	72.68	1.85	7.78
LSD $_{(p\leq0.05)}$	7.1677	1.9451	2.289	0.8665	2.4931	14.5619	1.0485	1.9924

N.S: Non significant

Figure (2) shows cluster analysis results of all grass pea genotypes based on seed yield and its components. As shown in the figure there were two major (K=2) groups for studies grass pea genotypes. The first group consist of two sub-group, each group consist of two genotypes, which were (IF1346, IF1332), (IF1347 and Marble) respectively, The second group had (IF1344) and (IF1953). The results confirmed that the variability occurred among genotypes used in this study.

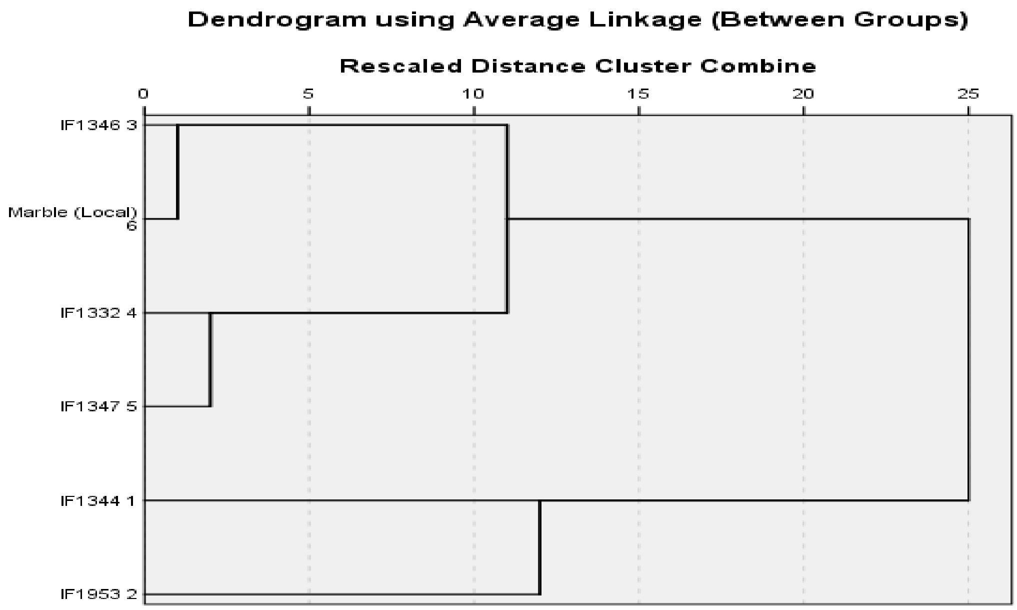


Figure (2) Dendrogram of six grass pea genotypes based on cluster analysis of seed yield and its components

CONCLUSIONS:

From the results of this study, we concluded that all forage yields, forage yield components, seed yield and its components were significantly affected by genotypes except dry forage yield, leaves /stem ratio, straw yield and harvest index were not significant.

1. Marble (Local) genotype recorded maximum value for these traits (fresh forage yield, No. of branches/plant, fresh stem percent and dry stem percent) while IF1346 genotype gave maximum percent of dry matter, plant height and dry leaf percent.
2. There were two major (K=2) groups for studied grass pea genotypes, the first group consist of two sub groups, the first sub group had three genotypes were (IF1344, IF1953 and IF1346) and the second sub group had two genotypes (IF1332 and IF1347). Then the second group was one genotype (Marble) that indicates the presence of variability between genotypes used in this study.
3. Concerning seed yield and its components, IF1344 genotype gave the highest biological yield (ton.ha^{-1}), pods number.m^{-2}, pod yield (ton.ha^{-1}), and seed yield (ton.ha^{-1}), but the responsibility of seed yield component to genotypes were different.

RECOMMENDATION:

From the results of this study we recommend to select Marble (Local) and IF1346 Genotypes among all genotypes which were used for forage yield and dry matter production. And IF1344 for seed yield traits, due to their highest adaptation to the region of Sulaimani. It is a part of an attempt to use both genotypes as a cool season forage crops to provide forage yield during winter and early spring when alfalfa forage production is low.

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Appendixes:

Appendix (1) Mean Squares of variance for forage yield characters of grass pea

S.O.V	d.f	Green Forage Yield (ton.ha^{-1})	Dry Forage Yield (ton.ha^{-1})	Dry Matter %
Block	2	11.358352	0.3536827	0.412467
Genotype	5	16.7666495 *	0.2405814 $^{N.S}$	5.002081 *
Error	10	4.52778146	0.1353046	1.406098
Total	17			

N.S: Non Significant *: Significant

Appendix (2) Mean Squares of variance for forage yield components of grass pea

S.O.V	d.f	Plant Height (cm)	No. of Branches. Plant^{-1}	Fresh l Leaf %	Fresh Stem %	Dry leaf %	Dry stem %	Leaves. Stem^{-1} Ratio
Block	2	8.392	1.771	10.609	10.609	0.0768	0.046	0.064
Genotype	5	79.862 *	8.510 *	61.566 *	61.565 *	4.582 *	0.825 *	0.282 N.S
Error	10	10.654	2.360	7.822	7.822	1.377	0.115	0.114
Total	17							

N.S: Non Significant *: Significant

Appendix (3) Mean Squares of variance for seed yield of grass pea

S.O.V	d.f	Pods Number.m^{-2}	Pod Yield (ton.ha^{-1})	Biological Yield (ton.ha^{-1})	Seed Yield (ton.ha^{-1})	Straw Yield (ton.ha^{-1})	Harvest Index
Block	2	1897.082	0.2163417	0.052867	0.007372	0.0965750	0.0151722
Genotypes	5	10001.96*	0.078597*	0.21505*	0.028646*	0.134563 $^{N.S}$	0.025209$^{N.S}$
Error	10	1985.014	0.0051183	0.061447	0.0046055	0.0656063	0.0150122
Total	17						

N.S: Non Significant *: Significant

Appendix (4) Mean Squares of variance for seed yield components of grass pea

S.O.V	d.f	Plant Height (cm)	No. of Branches. Plant^{-1}	No. of Pods .Plant^{-1}	Pod Weight/. Plant^{-1} (gm)	No. of Seeds. Plant^{-1}	Seed Weight. Plant^{-1} (gm)	Average of Pod Length (cm)
Block	2	41.9443	5.83994	1.294239	3.2075167	605.6883	0.0073167	0.388889
Genotype	5	143.24*	4.98594*	14.4128*	17.18118*	1592.19*	11.72238*	0.12756$^{N.S}$
Error	10	15.5228	1.14315	1.584419	1.87797	64.06827	0.33217	0.226889
Total	17							

N.S: Non Significant *: Significant

تقييم بعض تراكيب وراثية للهرطمان (*Lathyrus Sativus* L.) للحاصل العلف والبذور ومكوناته تحت ظروف الأمطار في السليمانية

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المستخلص

اجريت تجربة حقلية في كلية العلوم الزراعية جامعة السليمانية اثناء الموسم الشتوي 2016/ 2017 لدراسة وتقييم بعض اصناف الهرطمان حاصل العلف والبذور ومكوناته تحت ظروف الامطار في منطقة السليمانية. وقد تم استخدام تصميم قطاعات كاملة العشوائية في ثلاث مكررات. تم استخدام 6 اصناف من الهرطمان واحد منهم صنف محلى باسم (ماربل) والخمس الاخرون (IF1344و ,IF1953و ,IF1346 و ,IF1332 و IF1347) من ايكاردا. واستخدام اقل فرق معنى LSD عند 0.05 للمقارنة بين الاصناف . اوضحت النتائج ان تأثير الاصناف بالنسبة لصفات حاصل العلف كان معنوي مع صفات حاصل العلف الغض (الاخضر) والمادة الجافه لكن التأثير لم يكن معنوي مع محصول العلف الجاف. الصنف ماربل اعطى اعلى محصول علف اخضر بينما الصنف IF1953 سجل اقل حاصل علف اخضر ولكن بالنسبة للمادة الجافة، فإن أعلى قيمة كان للصنف IF1346 ، بينما أعطى الصنف IF1332 أقل قيمة للمادة الجافة. فيما يتعلق بتأثير الأصناف بالنسبة الى صفات مكونات حاصل العلف فلقد كان التأثير معنوي لجميع الصفات ما عدا نسبة الاوراق الى الساق لم تكن معنوية، ولقد سجل الصنف IF1346 اعلى قيمه لصفة ارتفاع النبات ونسبة الأوراق الجافة ، في حين أن اقل قيمه لارتفاع النبات كان للصنف IF1332 ولكن اقل قيمه لصفة الأوراق الجافة كان للصنف ماربل .وبمشاهدة الصفات نجد ان عدد الفروع . النبات$^{-1}$ ، ونسبة السيقان الغضة (الخضراء) ، ونسبة السيقان الجافة الصنف ماربل اعطى اعلى قيمه لها ، بينما اقل قيمه لصفة عدد الفروع .النبات$^{-1}$ تم تسجيلها بواسطة صنف IF1346 ، ولكن اقل قيمه للسيقان الغضة ونسبة السيقان الجافة سجلت بواسطة صنفIF1347 . أظهرت نتائج التحليل العنقودي لجميع أصناف الهرطمان لحاصل العلف ومكوناته، أن هناك ثلاث مجموعات رئيسية (K = 2) لأصناف الهرطمان المدروسة، المجموعة الأولى تتكون من خمسة أصنافIF1344 ، IF1953، IF1346 ، IF1332 و IF1347 والمجموعة الثانية كانت مجموعة واحدة تتكون من الصنف ماربل . ولكن فيما يتعلق بغلة البذور ومكوناتها، فإن أعلى قيم لهذه الصفات (الحاصل البيولوجي، عدد القرون . م $^{-2}$ ، الحاصل القرنة ، وإنتاجية البذور) كان من الصنف IF1344 , أعلى قيمة من (ارتفاع النبات ، متوسط طول القرنة ، وزن 100 بذرة) اكتسبت بواسطة صنفIF1332 ، من ناحية أخرى أعطى الصنفIF1953 أعلى قيم (عدد الفروع . النبات$^{-1}$ ، وزن القرون . عدد النبات$^{-1}$ والبذور . النبات $^{-1}$، ولكن فيما يتعلق بـ (عدد القرون.النبات$^{-1}$ و وزن البذور . النبات$^{-1}$)، تم عرض القيم القصوى من الصنف IF1346 . تشير هذه النتائج الى وجود تباين بين التراكيب الوراثية المستخدمة في هذه الدراسة.

الكلمات المفتاحية: الهرطمان، التراكيب الوراثية، حاصل العلف ومكوناته، حاصل البذور ومكوناته، المادة الجافة %.