(*Lathyrus sativus* **L.**)

**Growth analysis, forage yield and quality of four Grass pea (*Lathyrus sativus* L.)
ecotypes as affected by plant density and planting method in double cropping system**

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(*Lathyrus sativus* L.)

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(Biederbeck *et al.*, 2005)

(Lathyrus   sativus   L.)   *(Lathyrus   sativus* L.)

(Lens   culinaris)   *Pisum   sativum)*   *(Vicia   sativa)*

.(Power, 1987)

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.(Loss *et al.*,1996)

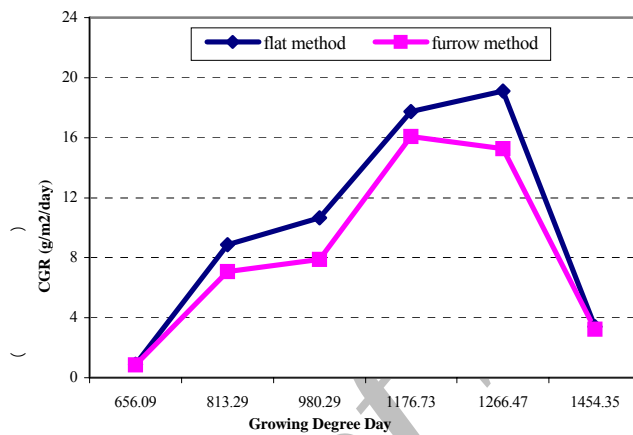.(   )   :

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.(Lazanyi, 2000)

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(*Vigna radiata*)   .(

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RGR   CGR   (Silty clay loam)

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(E_1) (

(E_4) (E_3) (E_2)

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NDF   (

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SAS   .

.   %

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(Crop Growth Rate)   (*Portulaca   oleraceae*)

(*Amaranthus retroflexus*)

.(   )   (*Chenopodium   album*)

(*Xanthium strumarium*)   (*Datura stramonium*)

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(/ $g.m^{-2}$ day^{-1}) CGR   .

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1- Crop Growth Rate
2- Relative Growth Rate
3- Neutral Detergent Fiber

Fig. 1. Trend of variation in crop growth rate of grass pea in two planting methods (Flat and furrow)
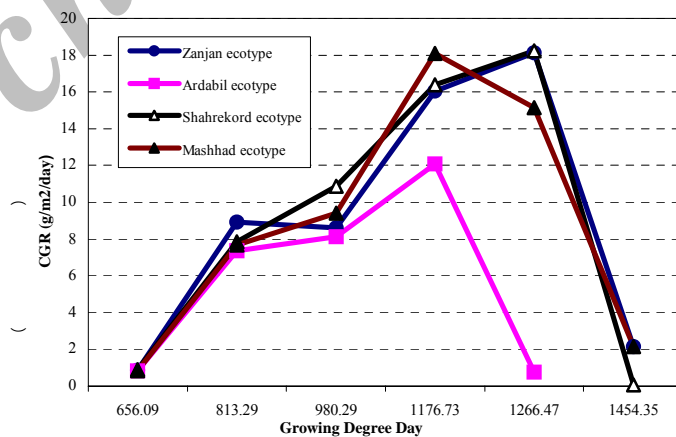
Fig. 2. Trend of variation in crop growth rate in four grass pea ecotypes
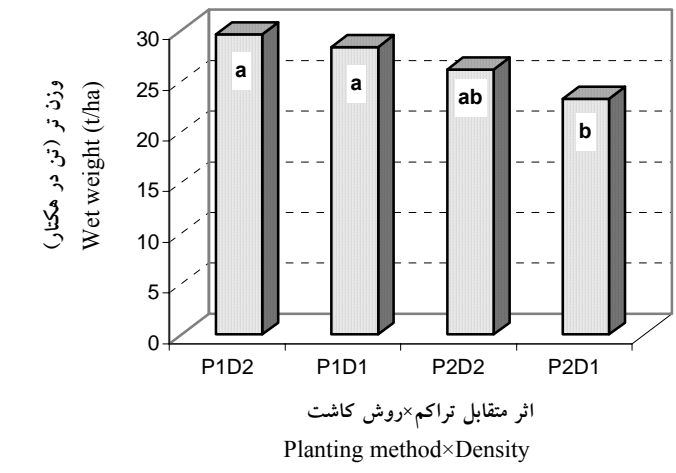
CGR

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RGR   .

CGR

RGR   .

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RGR

.(   )   (thermoperiod)   (photoperiod)

RGR   .(   )

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/   )   RGR

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(Relative Growth Rate)

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CGR

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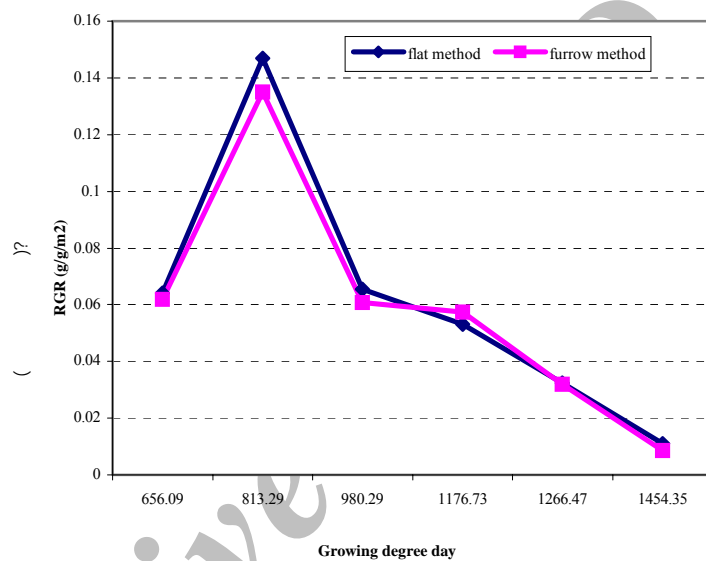
Fig. 3. Trend of variation in relative growth rate of grass pea in two planting methods in two planting method

(Flat and furrow)
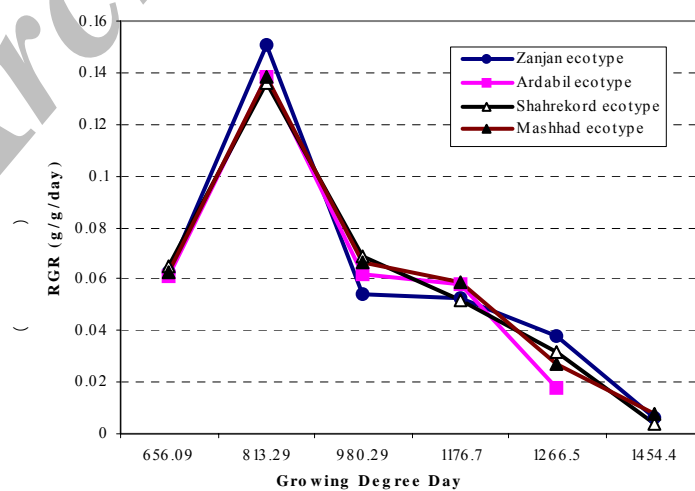
Fig. 4. Trend of variation in relative growth rate in four grass pea ecotypes

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P_1D_2 .

اثر متقابل تراکم×روش کاشت
Planting method×Density

$:P_2$ $:P_1$)   ×

.($:D_2$ $:D_1$

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Fig. 5. Interaction of planting method × plant density on grass pea fresh weight (P₁: flat method, P₂: furrow method, D₁: 110000 plant/ha and D₂: 220000 plant/ha). Columns with similar letter(s) are not significantly different at 5% probability level.

P_1E_4 (   )

)   ) $P_1D_1E_1$ (   )

.(Jorge, and Laure, 1999   (

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Table1: Analysis of variance of quantitative and quality traits in grass pea at final harvest stage

S.O.V	DF	FW	DW	PH	CP	NDF	OM	Ca	P
Replication	3	187.986^{ns}	4.098^{ns}	162.223^{ns}	0.417^{ns}	0.982^{ns}	3.212^{ns}	0.028^{ns}	0.00052^{ns}
Planting Method (P)	1	269.657**	7.33**	4778.265**	46.819**	53.582**	1.188^{ns}	0.137^{ns}	0.0045^{ns}
Density (D)	1	81.563^{ns}	5.784*	907.515**	36.693**	1.113^{ns}	4.171*	0.159^{ns}	0.0064^{ns}
Ecotype (E)	3	197.735**	21.039**	2596.22**	55.359**	23.277**	0.701^{ns}	0.194*	0.00123^{ns}
D×P	1	6.91^{ns}	0.191^{ns}	159.39*	7.466**	11.407**	0.0462^{ns}	1.473**	0.011^{ns}
E×P	3	15.312^{ns}	0.127^{ns}	118.432*	57.718**	9.016*	0.304^{ns}	0.34**	0.0124*
E×D	3	122.626**	1.872^{ns}	23.432^{ns}	13.382**	6.279*	0.622^{ns}	0.154*	0.0181**
E×D×P	3	10.831^{ns}	0.187^{ns}	110.39*	11.17**	12.123**	1.542^{ns}	0.313**	0.0096^{ns}
Error	45	25.824	0.9777	31.824	0.528	1.432	0.992	0.04	0.00303
C.V. (%)		18.97	18.37	6.21	3.10	2.83	1.09	8.66	11.67

* and ** Significant at 5% and 1% probability levels, respectively.

ns: Non-Significant

FW: Fresh Weight   DW: Dry Weight   PH: Plant High   CP: Crude Protein   NDF: Neutral Detergent Fiber   OM: Organic Matter   Ca: Calcium   P:Phosphorus

اثر متقابل تراکم×روش کاشت
Planting method×Density

P_2: P_1)   ×

D_1: D_2:   .(

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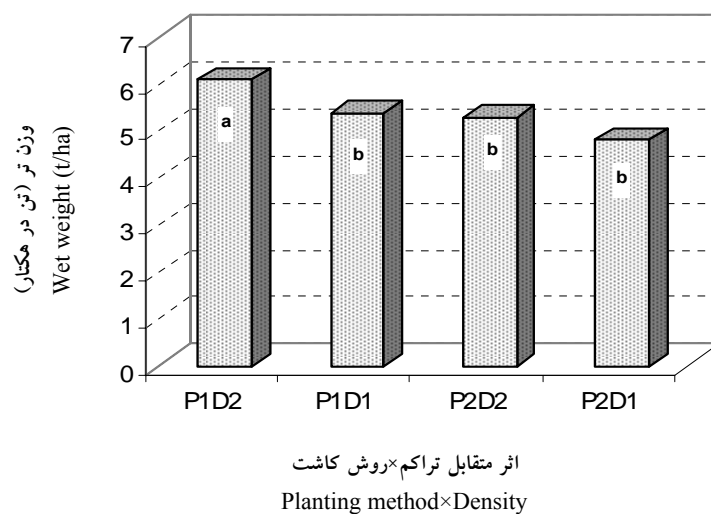
Fig. 6: Interaction of planting method × plant density on grass pea dry weight (P₁: flat method, P₂: furrow method, D₁: 110000 plant/ha and D₂: 220000 plant/ha).Columns with the similar letter(s) are not significantly different at 5% probability level.

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P1D2E4   .

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.(P ≤0.05)

Table 2: Mean comparison of quantitative and quality traits of grass pea at final harvest stage

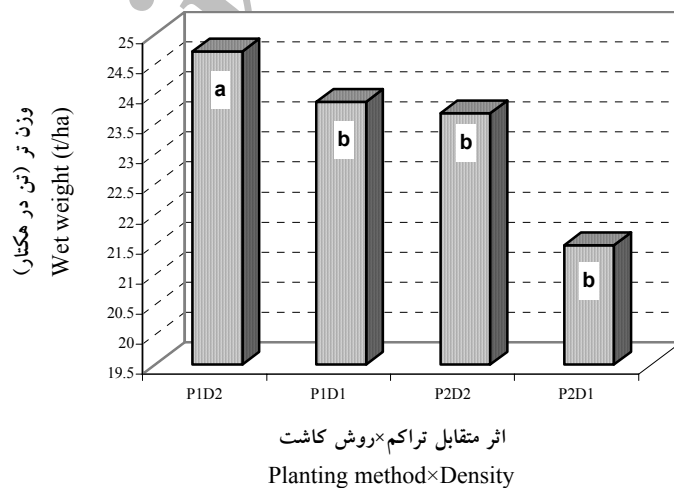| Treatment	FW (t/ha)	DW (t/ha)	PH (cm)	CP (%)	NDF (%)	OM (%)	Ca (%)	P (%)
$P_1D_1E_1$	32.38 a	6.56 ab	99.5 b	22.16 g	42.77 bc	91.64 ab	2.157 de	0.475 bcde
$P_1D_1E_2$	19.57 dc	3.31 d	70.5 f	29.78 a	37.8 f	91.16 ab	2.41 bcd	0.442 bcde
$P_1D_1E_3$	29.85 ab	5.67 ab	109.75 a	22.95 gf	41.95 dc	91.22 ab	1.82 f	0.435 cde
$P_1D_1E_4$	30.63 ab	5.91 ab	96.25 bc	20.62 h	40.65 de	92.05 ab	2.33 bcd	0.477 bcde
$P_1D_2E_1$	28.61 ab	6.06 ab	112 a	26.03 c	42.5 dc	91.24 ab	2.187 cde	0.452 bcde
$P_1D_2E_2$	30.95 ab	4.91 bc	86.5 de	27.13 b	42.31 dc	91.16 ab	2.495 bc	0.46 bcde
$P_1D_2E_3$	27.17 abc	6.57 ab	110.75 a	25.02 dc	42 dc	90.82 ab	2.505 bc	0.605 a
$P_1D_2E_4$	31.83 a	6.75 a	109.5 a	20.65 h	40.79 de	91.01 ab	2.35 bcd	0.497 bcd
$P_2D_1E_1$	27.75 abc	5.77 ab	83.75 e	17.69 i	46.14 a	91.58 ab	2.47 bcd	0.47 bcde
$P_2D_1E_2$	13.61 d	2.76 d	63.75 f	21.88 g	44.67 ab	92.12 a	2.535 b	0.532 ab
$P_2D_1E_3$	24.32 abc	5.42 ab	84.25 e	22.08 g	43.02 bc	90.40 b	2.935 a	0.4000 e
$P_2D_1E_4$	27.43 abc	5.23 ab	87.75 cde	24.29 de	40.03 e	91.09 ab	2.36 bcd	0.465 bcde
$P_2D_2E_1$	27.16 abc	5.55 ab	82.25 e	21.86 g	43.54 bc	90.72 ab	1.85 f	0.51 bc
$P_2D_2E_2$	22.91 bc	3.66 dc	66.75 f	25.56 c	42.91 bc	90.42 ab	1.972 ef	0.405 de
$P_2D_2E_3$	26.84 abc	5.89 ab	94 bcd	23.31 ef	43.16 bc	90.92 ab	2.37 bcd	0.447 bcde
$P_2D_2E_4$	27.85 abc	6.04 ab	94 bcd	23.99 def	41.93 dc	90.88 ab	2.502 bc	0.48 bcde

Means in each column with the same letter are not significantly different at 5% probability level-using Duncan's Multiple Range Test.

P_1: flat method, P_2: Forrow method, D_1:110000 Plant/ha; D_2: 220000 Plant/ha, E_1: Zanjan Ecotype, E_2:Ardabil Ecotype, E_3: Shahr-e-kord Ecotype, E_4:Mashhad Ecotype
FW: Fresh Weight DW: Dry Weight PH: Plant High CP: Crude Protein NDF: Neutral Detergent Fiber OM: Organic Matter Ca: Calcium P: Phosphorus

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$P_1 \times D_2$

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وزن تر (تن در هکتار)
Wet weight (t/ha)

اثر متقابل تراکم×روش کاشت
Planting method×Density

:P₂   :P₁)   ×

.(:D₂   :D₁

Fig.7. Interaction of planting method × plant density on crud protein percent in grass pea dried fodder (P1: flat method, P2: furrow method, D1: 110000 plant/ha and D2: 220000 plant/ha).Columns with the similar letter(s) are not significantly different at 5% probability level.

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P_1E_2) .   D×E   P×E

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Fig. 8. Comparison of crude protein (%) in grass pea fodder with some other winter and summer forage crops (Adapted from experimental data of: Ghane, 2004; Sharifi *et.al*, 2004; Eshaghahmadi, 2004 and Mohammadi, 2004).

(P≤ 0.05)

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Fig 9. Comparison of crude protein (%) in grass pea fodder with some other winter and summer forage crops
(Adapted from experimental data of: Ghane, 2004; Sharifi *et.al*, 2004; Eshaghahmadi, 2004 and Mohammadi,
2004).

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(*Lathyrus sativus*)

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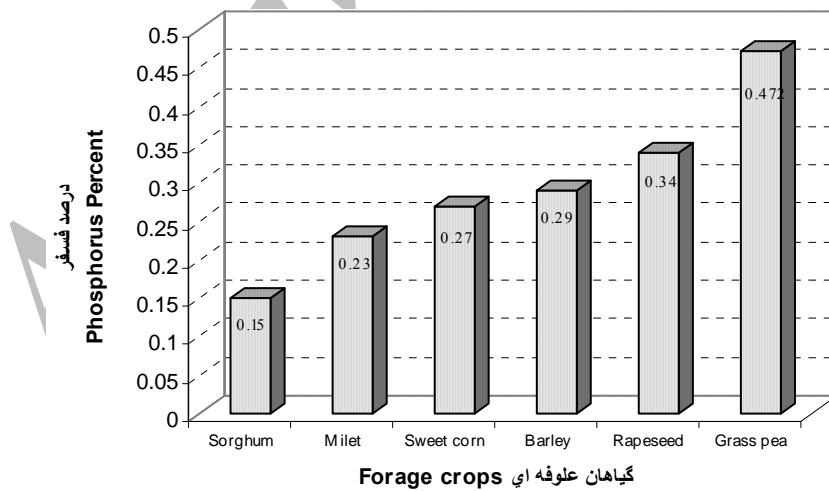
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Growth analysis, forage yield and quality of four Grass pea (*Lathyrus sativus* L.) ecotypes as affected by plant density and planting method in double cropping system

Morsali[1], A., M. Aghaalikhani[2] and A. Ghalavand[3]

ABSTRACT

Morsali A., M. Aghaalikhani and A. Ghalavand. 2007. Growth analysis, forage yield and quality of four Grass pea (*Lathyrus sativus* L.) ecotypes as affected by plant density and planting method in double cropping system. **Iranian Journal of Crop Sciences. 9(3): 256-262.**

In order to study the effect of plant density and planting method on forage yield and quality of four grass pea (*Lathyrus sativus* L.) ecotypes, a field experiment was carried out during 2005 summer season in Hidaj town (Zanjan province, Iran). Treatments were arranged in a factorial experiment using Randomized Complete Blocks Design with four replications. Grass pea seeds of Zanjan, Ardabil, Shahre-e-Kord and Mashhad ecotypes (E_1-E_4) were sown in two planting methods (flat plots and furrowed plots) (P1 and P2) at two plant densities (110,000 and 220,000 p.ha^{-1}) (D_1 and D_2) on July 28, 2005. The former crop was wheat. Seven destructive samples were taken during grass pea growing season to study the trend of CGR and RGR. Different quantitative traits (plant height, forage fresh and dry yield) and quality traits [DM(%), crude protein(%), Ca(%), P(%) and NDF(%)] of forage were measured. Result showed that grass pea grown in flat plots had higher CGR and RGR. Also fresh and dry forage yield in flat plots with 220000 p.ha^{-1} were significantly more than furrowed plots with 110/000 p.ha^{-1}. Mashhad ecotype by producing 29.4 t.ha^{-1} fresh forage yield and 5.98 t.ha^{-1} dry forage yield was the best forage producer among all ecotypes. However, there was no significant difference between Mashhad, Zanjan and Shahre-e-Kord ecotypes. The Ardabil ecotype produced the lowest forage yield as 21.7 t.ha^{-1} and 2.66 t.ha^{-1} for fresh and dry weight, respectively. Plant height in dense plots (220000 p.ha^{-1}) was significantly higher than 110,000 p.ha^{-1}. Crude protein percent was significantly affected by all factors. Main effects of planting method and plant density were significant for Ca% and NDF%. Phosphorus percent has not affected by any of experimental factors. The Ardabil, Zanjan and Shahre-e-Kord ecotypes were superior for CP%, NDF% and Ca%, respectively. It can be concluded that $P_1D_2E_4$ system (Mashhad ecotype sown in flat plots with 220000 p.ha^{-1}) was superior.

Keyword: Grass pea (*Lathyrus sativus* L.), Plant density, Forage yield, Planting pattern, Double cropping system