

The study of traits correlation and path analysis of the grain yield of the peas in semi-dry conditions in Kermanshah

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Abstract. In recent years, decreasing atmospheric descending and dehydration problem in the country, employing minimal irrigation on crops that can be in semi-dry conditions also, have considerable economic production, is considered water resource management strategy. To determine the relationships between yield components and some traits with the grain yield in the peas and determine cause and effect relationship between their in different needs moisture conditions, an experiment with three levels of the supplemental irrigation (irrigation at flowering, at podind and at flowering and poding stages), and without the supplemental irrigation and four levels of the densities 30, 50, 70 and 90 plants m⁻², as a split-plot based on randomized complete block design with three replications, in 2010, at the Campus of Agriculture and Natural Resources of Razi University, was conducted. The results of the traits correlation showed that the traits grains per pod, pods per plant and harvest index have a positive and high correlation with the grain yield. The results of the path analysis, it was revealed, that the most direct effect and positive on grain yield, was related to, harvest index and the most indirect effect and positive was related to the trait of pods per plant, through harvest index. As a result, harvest index can have an important influence on the yield.

Keys word: peas, supplemental irrigation, correlation and path analysis

1. Introduction

Understanding of the relationship between the traits, for the selection of the important traits, is the utmost importance. The goal of the path analysis, is that, the acceptable descriptions of the correlation between the traits, based on a model of caused and effect, is presented, and the importance of the affecting traits on a specific trait is estimated. In fact, the basic relationships between the traits are expressed by this analysis. So that, the correlation coefficients dividing to the direct and the indirect effects of the set of the independent variables on a dependent variable, and their importance is calculated. Several researches of the relationships and traits effect of plants have been reported. In the path analysis of the some quantitative traits of soybean were identified, the number of pods per plant, the weight of 100-grains and the number of the grains per plant compared to other traits, had the most direct effect on the yield [4]. Also, there was a direct and significant correlation between the numbers of grains per pod, the number of pods per plant and pod length with the grain yield of the common bean [9]. In an experiment that performed on the peas plant, it was cleared that, there was positive and significant correlation between the number of pods per plant, the weight of 100-grains and the number of lateral branches with grain yield. Also, indicated that, the number of pods per plant, the pod length and vine length had most direct effect on the grain yield of the peas [3]. The peas grain yield had a positive correlation with the plant height, the number of pod, the number of grains per pod and the yield of the pod, and pod yield showed the high direct effect in this plant [2].

The purpose of implementing of this experiment was the investigation of the relationship between the yield and its components, analyzing the simple correlation coefficients between the traits and determining the traits which had the greatest effect over the peas grain yield in this experiment conditions.

2. Materials and Methods

This experiment was conducted at the Research Farm of Campus of Agriculture and Natural Resources of Razi University. The experiment was performed as split-plot based on the Randomized Complete Block Design with three replications. The factors including the different levels of the supplemental irrigation at the flowering, at the podding, at the flowering and podding stages with control (without supplemental irrigation), in main plots and different levels of the planting density 30, 50, 70 and 90 plants m⁻², that were in the sub-plots. Culturing was performed on March 16, 2010 manually. The traits of the supplemental irrigation were applied during the season of the plant growth and development at the 50 percent of flowering and the 50 percent of podding times. Harvesting was performed, as hand-done on May 25, 2010, when the pods were until light green and containing soft and fresh grains. At the time of harvesting, 10 plants were separated for each square meter of plot and then, the grain yield was counted. The number of pods per plant, the number of grains per pod and the lateral branches were counted from average 10 plants of each plot and the harvest index also was calculated by dividing the grain yield on the biological yield as percentage. In order to, predict the relationships of the yield and its components and to eliminate the least important variable, as well as, the beginning of the path analysis from the stepwise regression analysis the software of SPSS was used. For discover the relationships between the yield and its components, the method of the path analysis were used [5].

3. Results and Discussion

3.1. Correlation between traits

The results of correlation between the traits (Table 1), show that, the harvest index and trait of the number of pods per plant have highest correlation with the peas grain (95 and 92 percent respectively), in other way, the traits of the number of the lateral branch and the grain weight, showed the lowest correlation with the grain yield.

Table 1. Simple correlation coefficients between the traits

Traits	Pods per plant	Grains per pod	Grain weight	Lateral branch	Harvest index
Pods per plant	1				
Grains per pod	0.76**	1			
Grain weight	0.42 ^{ns}	0.32 ^{ns}	1		
Lateral branch	0.21 ^{ns}	0.08 ^{ns}	0.02 ^{ns}	1	
Harvest index	0.86**	0.73**	0.37 ^{ns}	0.15 ^{ns}	1
Grain yield	0.92**	0.86**	0.42 ^{ns}	0.13 ^{ns}	0.95**

ns, and ** not significant and significant at the 0.01 level of probability, respectively.

3.2. Multiple liner regression analysis

The results show that, among the traits affecting on the grain yield, the number of pods per plant, the number of grains per pod and the harvest index as the independent variables have interred to the model (Figure 1), and had highly coefficient of determination and standardized coefficient of determination (97 percent). But, the traits of the number of the lateral branches and the grain weight didn't enter to the model (Table 2). In an experiment on the common bean, it was cleared that, only the number of pods per plant affecting on the grain yield. And mostly direct and positive effects were related to traits of the number of grains per pod and harvest index [8].

Table 2. Path analysis with direct effects, residual, coefficient of determination and standardized coefficient of determination

Depend variable	Independent variable	Direct effect	Residual	Coefficient of determination	Standardized coefficient of determination
Grain yield	Pods per plant	0.23	0.15	0.97	0.97
	Grains per pod	0.31			
	Harvest index	0.52			

3.3. Path analysis

The results of the path analysis show that (Table 3), the harvest index had the highest positive direct effect (52 percent), on the peas grain yield. Also, the number of pods per plant had the lowest rate of the direct effect (23 percent), with the grain yield. However, the trait of the number of pods per plant through the harvest index, has the highest indirect and positive effect (45 percent), on the grain yield. It shows that, the direct selection of the yield based on the number of pods per plant can not be a property selection, but the harvest index should be considered, too. Also, the trait of the number of grains per pod has the most indirect effect through the harvest index, compared to its direct effect on the grain yield (Table 3).

Table 3. Path analysis with indirect effects and total correlation with depend traits

Variable	Direct effect	Indirect effect by			Total correlation with grain yield
		Pods per plant	Grains per pod	Harvest index	
Pods per plant	0.23	-	0.24	0.45	0.92
Grains per pod	0.31	0.17	-	0.38	0.87
Harvest index	0.52	0.19	0.23	-	0.95

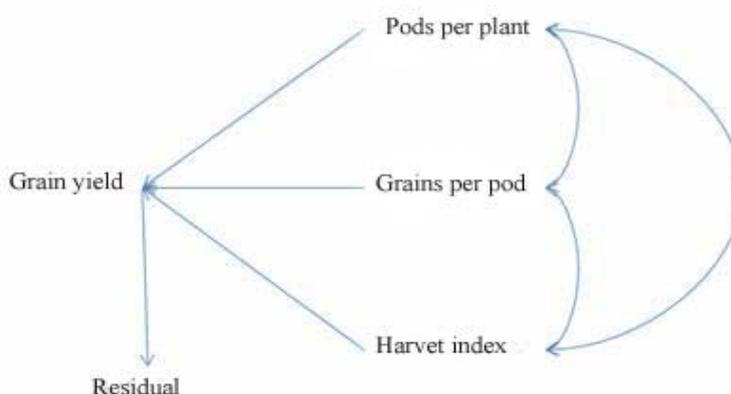


Figure 1. The model of affecting variables on the yield

The results of some researches showed that, the biological yield and harvest index were affecting factors on the grain yield of soybean [7], and grain yield of the narbonbean (*Vicia narbonensis* L.) [6]. Also, indicated that, the number of grains per pod had an indirect positive effect through 100-grains weight on the peas [1], and the harvest index was an important factor that had mostly effect on the grain yield of the peas [10].

3.4. Conclusion

In all, by the attention to results obtained, it can be said, in this experiment, the harvest index both through its direct effect as well as, as an effective factor on the indirect effects of the two major components of peas yield, namely the number of pods per plant and the number of grains per pod, its effect showed on the grain yield of this plant. In fact, it can be said that, the harvest index according to the highly correlation with the grain yield, can be considered as an important factor in determining the peas grain yield in this experiment.

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5. References

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