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***Research article***

# CORRELATION AND PATH ANALYSIS OF SOYBEAN YIELD COMPONENTS

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**ABSTRACT:** To obtain more productive soybean genotypes, it is essential to know the contribution of each yield component to productivity.Thus, the objective of this work was to identify the relative contribution and correlation through path analysis of yield components in the final yield of soybean genotypes. The study was conducted in 2011/2012, in a greenhouse. The experimental design was a randomized block with six treatments (genotypes) and four repetitions. The genotypes M-SOY 7211 RR, TMG 123 RR , TMG 1176 RR, M-SOY 7908 RR, TMG 127 RR and TMG 7188 RR were used. The number of pods/plant and seeds/plant, 100-seed weight and seed yield/plant were determined. The number of pods/plant showed high and positive correlation with the productivity, while for the 100-seed weight; the correlation was high and negative. Through path analysis, it was observed that the number ofseeds/plant was the component of a more direct effect on the yield, and the effect of the number of pods/plant in the productivity is basedon indirect effect of the number of seed plant.
**Key words**: Soya bean, Path analysis, yield

## INTRODUCTION

The current challenge of soybean crop is to develop improved cultivars that exceed the yield to those already available, either by direct increase in productivity, or the introduction of resistance to pests and pathogens to avoid loss of seeds. Regarding the direct increase in yield, it is a complex trait, because it depends on various other factors that act indirectly and interact each other. Thus, knowledge of the relationship between these characteristics that make up the final yield of soybean genotype is important in enabling a more precise identification of the components that can determine a more productive plant. Among yield components of soybeans, the main ones are the number of pods/plant, seeds/plant and 100-seed weight. The number of pods is determined by the balance between the flower production per plant and the ratio of those that develop to become a legume [3]. The number of seeds per plant is directly linked to the number of seeds per pod, and is a genetic feature that suffers little influence from the environment, thus most modern cultivars are selected aiming for three seeds per pod. The 100-seed weight is genetically determined, being modified only when there is high environmental stress, such as water deficit during seed filling.

The objective of this work was to identify the relative contribution and correlation through path analysis of yield components in the final yield of soybean genotypes.

## MATERIAL AND METHODS

The study was conducted in 2011/2012 in the greenhouse. Soybeanswere sown on 12/05/2011 in pots containing 2.5L soil, using two plants per pot. The experimental design was a randomized block, with six treatments (cultivars) and four repetitions. The M 7211 RR, TMG 123 RR, TMG 1176 RR, M 7908 RR, TMG 127 RR and TMG 7188 RR were used. The plants were harvested at R8 stage, and the following variables were determined: pods/plant, seeds/plant, 100-seed weight and seed yield/plant. The data was subjected to variance analyses and comparison by means of Tukey Test. Thephenotypic variances and co-variances, obtained by ANOVA, created the correlation matrix between characters.

The path analysis was carried out considering the main variable (yield/plant) as a function of yield components (pods/ plant, grain/plant, 100-seed weight). Analyses were performed in Genes program [2], and for path analysis, the values of yield components were then transformed to the logarithmic scale, due to the existence of the interrelationship between them, because of the multiplicative effect.

## RESULTS AND DISCUSSION

All of the yield components had significant effect at the 1% level of probability, according to the genotype effect. Only plant productivity was not statistically significant (Table 1).

**Table 1. Variance Analysis of yield components and seed yield of six soybean genotypes.**

| Sourceofvariation | | Mean Square | | |
|---|---|---|---|---|
| | Pod/palnt | Seed/plant | 100-seed weight | yield |
| Genotype | 373,935** | 1649,635** | 38,004** | 6,507ns |
| Residue | 54,435 | 224,118 | 1,311 | 4,370 |
| Means | 48,729 | 114,979 | 19,364 | 21,505 |
| CV(%) | 15,14 | 13,02 | 5,914 | 9,721 |

**; * And ns = Significant at 1%; 5% probability and not significant, respectively, by F test.

In Table 2, we observe that for the number of pods, the values ranged from 36.6 to 62.7 pods/plant, and the TMG 7188 RR cultivar had the highest number of pods, while the M-7908 RR cultivar showed the lowest amount of pods. Knowing that the number of pods/plant has great influence on seed yield, TMG 7188 RRcould be considered as the most productive, however, after observing the other components, it appears that soybeans has a compensatory effect.

The number of seeds/plant showed a similar behavior with the number of pods/plant for the cultivars, but stood out for this trait the TMG 1176 RR cultivar, which had the largest number. However, this can be explained because this cultivar produced a considerable number of pods with 4seeds, a factor that also does not ensure higher productivity.

By observing the 100-seed weight, it was found that cultivars that have the largest number of seeds/plant are those with lower than 100-seed weight, which explains why this isnot significance for the mean yield of the cultivars studied. Bizeti et al. [1] demonstrated that soybeanscan increase or decrease the number of seeds due to their size as a kind of buffering, without significant variation in seed yield. Navarro Junior and Costa [4] studied six genotypes, observed variation among yield components, and highlightedhow the relative importance of each component varied according to the cultivar.

**Table 2. Means of pods/plant, seeds/plant, 100-seed weight and seed yield/plant of six soybean genotypes.**

| Genotypes | Pods/plant | Seeds/plant | 100-seed weight | yield (g/planta) |
|---|---|---|---|---|
| TMG 123 RR | 44,8 bc | 124,1 ab | 16,89 cd | 20,80 a |
| TMG 1176 RR | 47,0 abc | 136,5 a | 16,50 d | 22,25 a |
| M 7211 RR | 57,6 ab | 115,0 abc | 19,30 bc | 21,71 a |
| M 7908 RR | 36,6 c | 83,3 c | 24,8 a | 20,46 a |
| TMG 127 RR | 43,5 bc | 99,3 bc | 20,69 b | 20,22 a |
| TMG 7188 RR | 62,7 a | 131,5 ab | 17,98 cd | 23,58 a |

Means followed by the same letters in columns do not differ at 5% probability by Tukey test.

The correlation analysis (Table 3) revealed high negative correlation between seeds/plant and 100-seed weight, which was observed by means of genotypes, ie the greater the number of seeds/plant,the lower the 100-seed weight. However, the number of seeds/plant has relatively high correlation (0.74) with yield. The number of pods/plant has a high correlation with yield and a negative correlation with the 100-seed weight. The 100-seed weight has a negative correlation with the yield, that is, yieldis more directly related to the number of seeds/plant than the 100-seed weight.

When performing path analysis (Table 4), it was found that the number of pods/plant showed a positive direct effect on yield, indirect effect of seeds/plant is largely responsible for this.The indirect effect via mass 100 grains was negative. The number of seeds/plant showed a high positive direct effect on yield with little indirect effect via pods/plant and was negative via 100-seedweight.

**Table 3. Estimated Pearson correlation phenotypic between yield components of six soybean genotypes.**

| | Pods/plant | Seeds/plant | 100-seed weight | Yield (g/planta) |
|---|---|---|---|---|
| **Pods/plant** | ---- | 0,63 | -0,52 | 0,83* |
| **Seeds/plant** | | ---- | -0,95** | 0,74 |
| **100-seed weight** | | | ---- | -0,54 |
| **Yield (g/planta)** | | | | ---- |

**; * And ns = Significant at 1%; 5% probability and not significant, respectively, by F test.

The 100-seed weight showed lower direct effect on yield, and the indirect effect via seeds/plant was highly negative. Perini et al., (2011) observed similar results in the 100-seed weight. The indirect effect via number of seed per plant was also high and negative. This is due to the high negative correlation between variables, that is, as the number of seeds increases, their individualweight decreases.

**Table 4. Estimates of the direct and indirect effects of variables: pods/plant, seeds/plant and 100-seed weight on the main variable seed yield, in six soybean genotypes.**

| Effect | Estimate |
|---|---|
| Pod/plant | |
| Direct in yield | 0,529 |
| Indirect via seed/plant | 0,519 |
| Indirect via 100-seed weight | -0,250 |
| Total | 0,833 |
| Seed/plant | |
| Direct in yield | 0,736 |
| Indirect via seed/plant | 0,373 |
| Indirect via 100-seed weight | -0,430 |
| Total | 0,738 |
| 100-seed weight | |
| Direct in yield | 0,444 |
| Indirect via seed/plant | -0,298 |
| Indirect via 100-seed weight | -0,713 |
| Total | -0,538 |
| $R^2$ | 0,74 |
| Residual effect | 0,50 |

## CONCLUSION

From the results obtained, it was observed that the number of seeds/plant is the component with the highest direct effect on the yield, and the effect of the number of pods in the plant productivity is basedon indirect effect of the number of the seeds/plant.

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