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THE EFFECT OF ARTIFICIAL SHADING ON THE GROWTH AND  
GRAIN YIELD OF BEANS (*Phaseolus vulgaris* L.)

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Multiple cropping is a common system for crop production in developing countries. In Brasil, beans are cultivated in association with other crops in more than 70% of the area used for bean production, and the association is more common with corn, either intercropped or relay cropped.

It has been observed that bean cultivars suffer the effect of shade promoted by other crops when intercropping system is used. However, bean cultivars differ in their response to shading.

An experiment was carried out in 1979 to evaluate four bean cultivars at three levels of light intensity. The four cultivars used were: Gordo (determinate), 'Iguacu' and 'Rico 23' (indeterminate, small guide) and 'Carioca' (indeterminate, long guide). The shading was induced artificially using jute sack cloth such that three levels of light intensity were produced. These were: 100%, 29% and 6% of photosynthetic active radiation and far-red. Leaf area, and the number and length of the internodes were measured 8 days after the beginning of flowering.

Results: Phenologic parameters such as emergence, flowering, and maturation dates were not affected by the light intensity levels. However, at 6% of total light intensity the plants etiolated excessively and died before the flowering stage.

Only Gordo cultivar had its number of internode reduced under low light intensity. However, all cultivars showed an increase in internode length as shading increased.

The plants of the four cultivars showed a decrease in the number of pods, seed yield per plant and leaf area efficiency as the shading level increased. At 29% of total light intensity, the yields of Rico-23, Iguacu, Carioca and Gordo were reduced to 54, 66, 83 and 90% respectively, of the treatment which received total light, indicating that Rico-23 is the most appropriate for an intercropping system among the four cultivars tested.

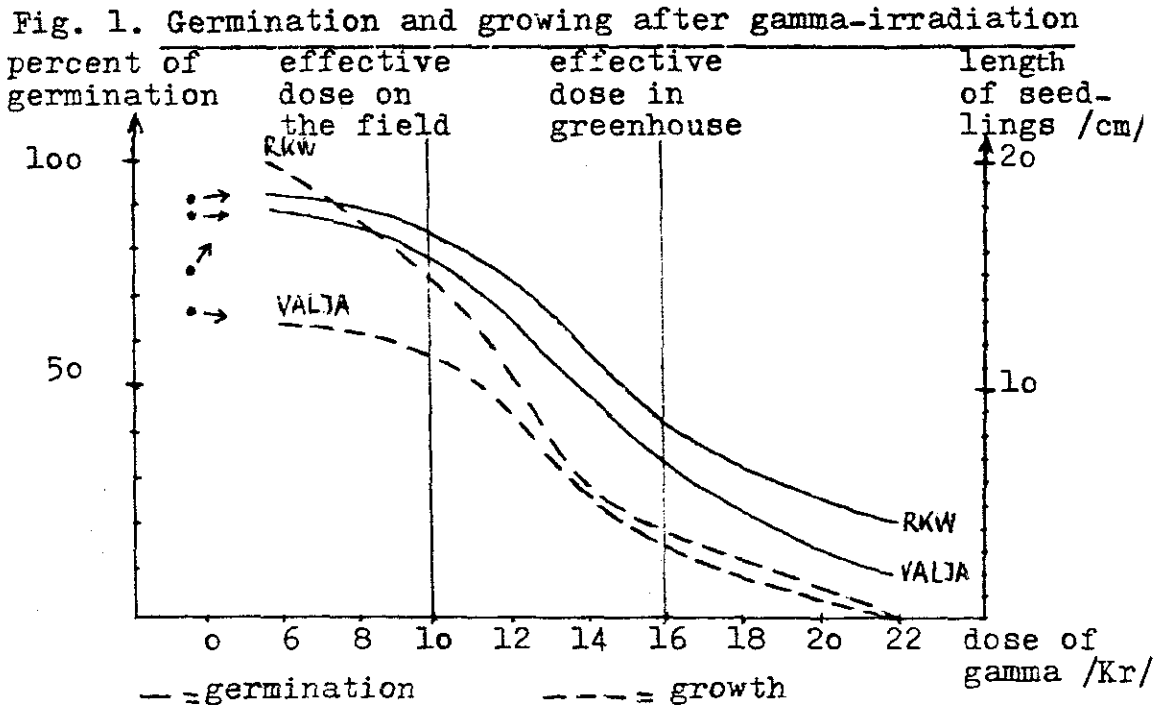
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INCREASED "TOLERANCE" TO *Pseudomonas phaseolicola*  
AFFECTED BY GAMMA-IRRADIATION

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In order to enhance the basic resistance in *Phaseolus vulgaris* to the

Hungarian isolates of Pseudomonas phaseolicola and to enhance the reaction-types of host pathogen we have used irradiations. Many trials identified the optimal dose (Fig. 1) to obtain maximum variation in the M<sub>2</sub> generations.



We estimated the variance of sensitivity by the artificial inoculation of seeds of the M<sub>2</sub> generation of the very sensitive R. Kinghorn Wax and the moderately tolerant Valja bean varieties after the gamma-irradiation of seed soaked two hours in 10<sup>8</sup> cell/ml inoculum of Hungarian Pseudomonas phaseolicola isolates (Table 1).

Table 1. The frequency of healthy plants after gamma-irradiation.

Control and irradiated	R. Kinghorn Wax	Valja
	The percent of healthy plants	
Control	0.7	25.7
Irradiated	23.8	32.5
LSD	9.2	5.6

In the two recent trials the inoculation of M<sub>2</sub> generations after the irradiation of 4000 seeds with 10.000 r Co<sup>60</sup>-gamma, in greenhouse resulted in decreased sensitivity of RKW and increased tolerance of Valja.

It appears the Hungarian Pseudomonas phaseolicola is adapted to the RKW variety during the long growing period, and the slightest changes of RKW tilts the host-parasite balance. We have started selection to utilize this phenomenon and to study the genetic background.