

LATERAL ROOT INITIATION IN RHIZOBIUM INOCULATED PEA SEEDLINGS

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Several root characters of seedlings were studied by Ali-Khan and Snoad (1) and some of these characters were found to be correlated with the seed weight. In our experiments with different *P. fulvum* pea seedlings, differences were observed in the time of appearance of the first lateral root. It was not clear whether these differences were caused directly by genetic variation, or indirectly by differences in seed weight of the lines studied. Here we report that both can influence the time of appearance of the first lateral root.

Pea seeds were germinated aseptically on water agar until the root length was 2-3 cm and the plumule had just emerged. They were then transplanted into sterile, plastic growth pouches (4) of 10 x 22 cm, containing N-free nutrient solution (5), two seedlings per pouch. The roots were inoculated with a suspension of *Rhizobium leguminosarum*, strain TOM, that forms effective nodules on line Fu 27 and ineffective nodules on lines Fu 3 and JI 224 (2). Plants were grown in a growth chamber at 22C and the roots were protected against light by wrapping the growth pouches in aluminum foil. The plants were inspected daily and the time of first lateral root formation was recorded.

In the first experiment, three pea lines were studied and within each, four different seed weight classes were distinguished. Table 1 shows first that there is a clear influence of the genotype. Line Fu 3 formed lateral roots more rapidly than line Fu 27. Line JI 224 was intermediate. Secondly, there is an inverse relationship between the seed weight and the time required to form laterals. Analysis of variance showed that both the effect of the lines and the effect of the seed weight classes were significant at the 0.5% level.

In the second experiment, the same three pea lines and their reciprocal F₁ hybrids were studied. Seed weight of the F₁ hybrids differed, depending on which line was used as the maternal parent (Table 2). Again line Fu 27 showed the slowest lateral root formation. Lines Fu 3 and JI 224 formed lateral roots more rapidly, but in this experiment the slight difference between these two lines was not significant. The F₁ hybrids of these "fast" lines, Fu 3 and JI 224, with the "slow" line Fu 27 also showed "fast" lateral root formation. There was a synergistic interaction between the "fast" lines Fu 3 and JI 224, since their hybrids formed lateral roots even more rapidly than the parental lines. The reciprocal F₁ hybrids did not differ from each other.

These experiments show clearly that both the pea genotype and the initial seed weight influence the time of formation of the first lateral root. However, the seedlings were inoculated with *Rhizobium ind*, as found in red clover, inoculation reduces the number of laterals at an early stage of development (2). It is not possible to conclude from our experiments whether inoculation with *Rhizobium* may influence the time of formation of the first lateral root in *P. fulvum* peas.

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1. Ali-Khan, S. T. and B. Snoad. 1977. Ann. Appl. Biol. 85:131-136.
2. Lie, T. A. 1981. Plant and Soil 61:125-134.
3. Nutman, P. S. 1948. Ann. Bot. 12:81-96.
4. Porter, F. E., I. S. Nelson, and E. K. Wold. 1966. Crops and Soil 18:10-11.
5. Winarno, R. and T. A. Lie. 1979. Plant and Soil 51:135-142.

Table 1. Time of appearance of the first lateral root (in days after transplanting into growth pouches) on *P. fulvum* seedlings from three lines and four different seed weight classes. Mean of 30 individuals.

Line	Seed weight class			
	50-59 mg	60-69 mg	70-79 mg	80-89 mg
Fu 27	5.77 a ^{1/}	5.37 ab	5.13 ab	5.00 b
Fu 3	4.30 cd	3.87 de	3.67 de	3.40 e
JI 224	5.17 ab	4.77 bc	4.63 bc	4.77 bc

^{1/}Means not followed by the same letter differ at the 1% level (Fisher).

Table 2. Time of appearance of the first lateral root (in days after transplanting into growth pouches) and initial seed weight of *P. fulvum* seedlings from three lines and their F₁ hybrids.

	Mean weight (in mg) per seed	Time (in days) of appearance of the first lateral root
Parental lines:		
Fu 27 (30) ^{1/}	94.2	5.10 a ^{2/}
Fu 3 (30)	74.4	4.33 b
JI 224 (30)	74.7	4.57 b
F ₁ hybrids:		
Fu 27 x Fu 3 (23)	92.2	4.30 b
Fu 3 x Fu 27 (17)	74.4	4.40 b
Fu 27 x JI 224 (20)	87.9	4.50 b
JI 224 x Fu 27 (20)	68.6	4.55 b
Fu 3 x JI 224 (20)	77.7	4.15 bc
JI 224 x Fu 3 (20)	78.6	3.70 c

^{1/}In parentheses: number of plants

^{2/}Means not followed by the same letter differ at the 1% level (Fisher)