Tennessee and each had performed fairly well. Some of the varieties with little rust resistance had in past trials shown favorable pod characteristics. However, rust infection generally lowered pod quality.

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DIFFERENTIAL RESPONSE OF BEAN VARIETIES TO ORDINARY SUPERPHOSPHATE

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In the south-central region of Brazil, in almost every fertilizer trial, beans respond to phosphorus application. Many times there is also response to N, but rarely does K increase the bean production. Because of this, normal or ordinary superphosphate is the most common fertilizer used by the bean growers.

A study was initiated in order to verify the response of several bean varieties (Phaseolus vulgaris) to that fertilizer. This study will provide the bean breeding programs as well as the fertilization programs with useful information.

Three experiments were carried out under field conditions at Paula Candido, Minas Gerais, using five levels of superphosphate: 0, 75, 150, 225, and 300 kg/ha of P_2O_5. Every plot received a uniform amount of nitrogenous and potassic fertilizers. Table 1 presents the most important results from the experiments. In all trials, significant differences ($P < 0.05$) among superphosphate levels and among varieties were found. In the last two experiments the interaction superphosphate levels x varieties was also significant ($P < 0.05$).

Most varieties gave maximum yields with 150 to 225 kg/ha of P_2O_5. There were, however, some striking differences. Three varieties--2015, Col. -123-N, and Vermelho Rajado 1162--gave the highest production with 300 kg/ha of P_2O_5, suggesting the possibility of further increase with higher levels of the fertilizer. On the other hand, variety 2017 Mexicano gave its maximum yield with only 75 kg/ha of P_2O_5. Only at this level of fertilization was this variety the most productive in the second experiment.

The highest yields were shown by the varieties 1818 Mex 487, Vermelho Rajado 1162, and Manteigão Preto 20. Variety 1818 Mex 487 produced 2332 kg/ha, about a seven-fold increase in relation to the treatment 0, with the application of 150 kg/ha of P_2O_5. Vermelho Rajado yielded 2232 kg/ha with the maximum amount of superphosphate. Manteigão Preto 20 produced little more than 2000 kg/ha with 150 kg/ha, an increase of almost six-fold in relation to the treatment 0.

Table 1. Yields (kg/ha) of bean varieties fertilized with different levels of ordinary superphosphate.

Variety	Levels of superphosphate (kg/ha of P_2O_5)				
	0	75	150	225	300
	First experiment				
Manteigao Preto 20	354	1737	2019	2035	2048
Rico 23	109	917	1360	1390	1350
Ricopardo 896	194	1292	1594	1710	1767
Costa Rica 1031	368	1458	1615	1869	1809
I-113	172	1206	1468	1468	1455
	Second experiment				
1818 Mex 487	320	1303	2332	1923	1681
1993 Sacavem 550	750	1177	1803	1900	1621
2004 S.A. 3	758	1189	1621	1905	1657
2015	307	1423	1479	1709	1918
2017 Mexicano	497	1523	1394	1370	1361
	Third experiment				
Tres Cores 106	377	1004	1249	1514	1484
Col.-123-N	463	1725	1862	1867	1957
Bico de Ouro 909	855	1402	1621	1655	1639
Vermelho Rajado 1162	488	1753	1979	2128	2232
Franguinho 1380	774	1375	1432	1351	1351

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A NEED TO SEARCH FOR OUTCROSSING MECHANISMS IN BEANS

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Traditional breeding methods, i.e. pedigree, back-cross followed by bulk or mass selection, are time-consuming and laborious. They are useful when the characters selected for are controlled by a few genes. But when a large number of genes are involved such as in case of quantitatively inherited traits or additive gene action, the population size required to recover desirable combination of genes is unmanageably large. And since relatively few crosses are made, the large population size is