

MINISTRY OF AGRICULTURE AND WATER DEVELOPMENT  
Magoye Regional Research Station  
Magoye, ZAMBIA

## Zambia

### 1) Development of promiscuous soybean varieties.

Zambia was perhaps the first country to initiate research on the development of promiscuous soybean varieties. Promiscuous soybean varieties have the capability of producing effective nodules with the indigenous rhizobia found in the Zambian soils. Two such varieties, 'Magoye' and 'Hernon 147', have already been released in Zambia. These varieties are very popular among small-scale farmers because these can be grown without artificial seed inoculation with *Rhizobium japonicum*.

The development of promiscuous varieties should be viewed as only one possible solution to overcome the problem of inadequate supplies of effective inoculum.

Farmers growing promiscuous varieties can always inoculate their seed before planting if they have sufficient inoculum available. They may even expect a positive yield response. However, if inoculum is not available, use of promiscuous varieties will certainly help in increasing soybean production by small-scale farmers.

During 1977-78 season, one commercially grown soybean variety, Hernon 147, was observed to have nodulated profusely when grown in virgin land without artificial seed inoculation (Javaheri and Nyemba, 1982). These scientists in 1979-80 season observed another breeding line, '71-38', from Queensland, Australia, which nodulated profusely without seed inoculation. This line was later released in April, 1981, under the name Magoye as the second commercial promiscuous soybean variety (Javaheri and Nyemba, 1982). Out of 400 cultivars planted on virgin land without seed inoculation at three different sites in Zambia, 35 to 50 cultivars were observed to be promiscuous and Javaheri (1982) reported that, among these cultivars, some had acceptable agronomic traits. The present investigation was undertaken to evaluate the efficiency of nodulation of selected promiscuous lines with indigenous rhizobia.

Materials and methods. The experiment was planted on virgin land (sandy loam) on December 14, 1983, at the Magoye Regional Research Station, Magoye, Zambia. Magoye is situated at Latitude S, 16°00', Longitude E, 27°36', at an elevation of 1018 meters.

Sixteen promiscuous lines selected from previous studies including two recommended promiscuous soybean varieties, Magoye and Hernon 147, were evaluated with and without inoculation in a split-plot design, varieties being main plots and inoculum sub-plots, with 4 replications. Each main plot consisted of 8 rows, rows being 50 cm apart and 5 m long. Each sub-plot consisted of 4 rows. Yield data were recorded from one of the two central rows (50 cm x 4 m) of each sub-plot. In the two central rows, 50 cm at either end was treated as nonexperimental area. The other central row was used for nodule count. Number of nodules per plant was recorded at 7 weeks after planting and at the end of flowering period for each treatment. Twenty plants were carefully dug for nodule count at each time. Magoye Regional Research Station received 588.6 mm of rainfall during 1983-84 growing season. This rainfall was about 200 mm less than the average rainfall for this site.

Results and discussion. The over-all mean yield without inoculation was 885 kg/ha and with inoculation 913 kg/ha, a slight increase of 3.2% over no inoculation (Table 1).

Table 1. Yield of soybean cultivars with and without inoculum

Cultivar	Without inoculum (kg/ha)	With inoculum (kg/ha)
1. P5	766	932
2. K39	1128	825
3. K49-14	714	761
4. Hernon 147	541	581
5. 49-18	1044	1317
6. K8	864	1013
7. P7	795	174
8. K79	1120	1043
9. K152	1128	1219
10. K53	1112	1205
11. M27	539	524
12. M30	1116	1296
13. K134	944	963
14. TG x 326 - 034D	609	591
15. TG x 297 - 192C	648	840
16. Magoye	1092	746
$\bar{X}$	885	913

Without inoculation, cultivar Magoye produced 1092 kg/ha, and five other lines, namely K39 (1128 kg/ha), K152 (1128 kg/ha), K79 (1120 kg/ha), M30 (1116 kg/ha) and K53 (1112 kg/ha), produced better yields than Magoye. Out of these 5 lines, K39 and K79 responded negatively to inoculation as far as yield is concerned. Negative response to yield in cultivar Magoye was also observed (Table 1). The yield levels of all cultivars in this study are very low. This is because the experiment was conducted on virgin land that has lower fertility status as compared to cultivated land.

The number of nodules per plant, 7 weeks after planting and at the end of flowering period, were slightly more with inoculation than without inoculation (Table 2). At 7 weeks after planting under no inoculation treatment, the number of nodules/plant for K79, M30, K53, K39, K152 and Magoye were 14.8, 10.5, 9.3, 7.0, 5.0 and no nodules, respectively, but at the end of the flowering period, the number of nodules per plant decreased slightly in case of K39, K79, K53 and M30. However, a large increase in case of Magoye (from 0 to 11.3 nodules per plant) was observed during the same period. The number of nodules per plant also increased (from 5.0 to 6.7) for K152 under no inoculation treatment.

Table 2. Number of nodules per plant

Cultivar	7 weeks after planting		At the end of flowering	
	Without inoculum	With inoculum	Without inoculum	With inoculum
1. P5	3.5	1.8	4.4	6.6
2. K39	7.0	13.8	6.3	6.6
3. 49-14	7.0	9.0	5.2	4.4
4. Hernon 147	3.0	3.8	2.5	3.2
5. 49-18	7.3	11.8	11.9	15.4
6. K8	5.0	1.8	9.4	8.4
7. P7	3.8	9.0	5.3	5.8
8. K79	14.8	2.3	11.8	13.9
9. K152	5.0	3.5	6.7	8.7
10. K53	9.3	12.8	7.7	9.6
11. M27	3.3	11.3	4.8	4.2
12. M30	10.5	1.5	9.1	11.4
13. K134	1.5	0.3	5.5	6.8
14. TG x 326 - 034D	0	0	0.6	6.0
15. TG x 297 - 192C	5.0	1.3	1.7	3.1
16. Magoye	0	7.8	11.3	8.7
$\bar{X}$	5.4	5.7	6.5	7.7

All six cultivars discussed are late maturing and take 137 to 142 days to mature. These six cultivars are now being evaluated in the Zambian promiscuous soybean variety trial at three different locations in Zambia.

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