

Evaluation of Local and Imported Soybean Accessions for Soybean Rust Resistance in Vietnam

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INTRODUCTION

Soybean is one of the traditional crops and a major source of protein in Vietnam. However, soybean production is mostly based on experience of the small hold farmers with a productivity of 1.33 tons/ha. Among biotic stress affecting soybean production, soybean rust, *Phakopsora pachyrhizi*, is one of the most aggressive pathogens. Conducive environment for the development of the disease was reported to cause yield losses up to 90%. With the effort to identify sources of resistance, 120 local and imported accessions were evaluated for rust resistance at PPRI in 2006. Eighteen lines were found to have resistance to the local rust isolate when inoculated in the net house.

OBJECTIVE

The objective was to evaluate a collection of germplasm from local and imported soybean lines for resistance to rust using isolate maintained at Thanh Tri, Hanoi, Vietnam.

MATERIALS AND METHOD

*Soybean lines

54 local soybean accessions were provided by Phyto-immunology Department, Institute of Agricultural Genetics (IAG), Legumes Research and Development Center (LRDC), Plant Resource Center (PRC), Vietnam. These lines were collected from many communities, districts and provinces throughout Vietnam (Table 1). Forty four soybean lines were received from the Asian Vegetable Research and Development Center (AVRDC, Taiwan), while 14 soybean lines were provided by the Commonwealth Scientific and Industrial Research Organization. (CSIRO - Australia). These lines were collected for evaluation of resistant to rust. DT2000 and DT12 were used as resistant and susceptible checks respectively.

*Pathogen source

We used a local unpurified isolate maintained in susceptible varieties DT12 and/or V74 in net house at Thanhtri – Hanoi-Vietnam.

*Experimental design

Ten seeds each of four accessions were planted in 20cm spacing 1m wide rows. Plants were thinned, five plants per accession were rated. Number of rows vary depending on the availability of seeds per accession used in the experiment.

*Inoculation method (Binh et al., 2005)

Plant were inoculated at V2 growth stage with a spore suspension of 5×10^4 spore/ml in late afternoon. Plastic sheets were used to cover the plants after inoculation to build up a favorable conditions such as high humidity (100 %) for 10-12 hours.

*Disease assessment and statistical analysis

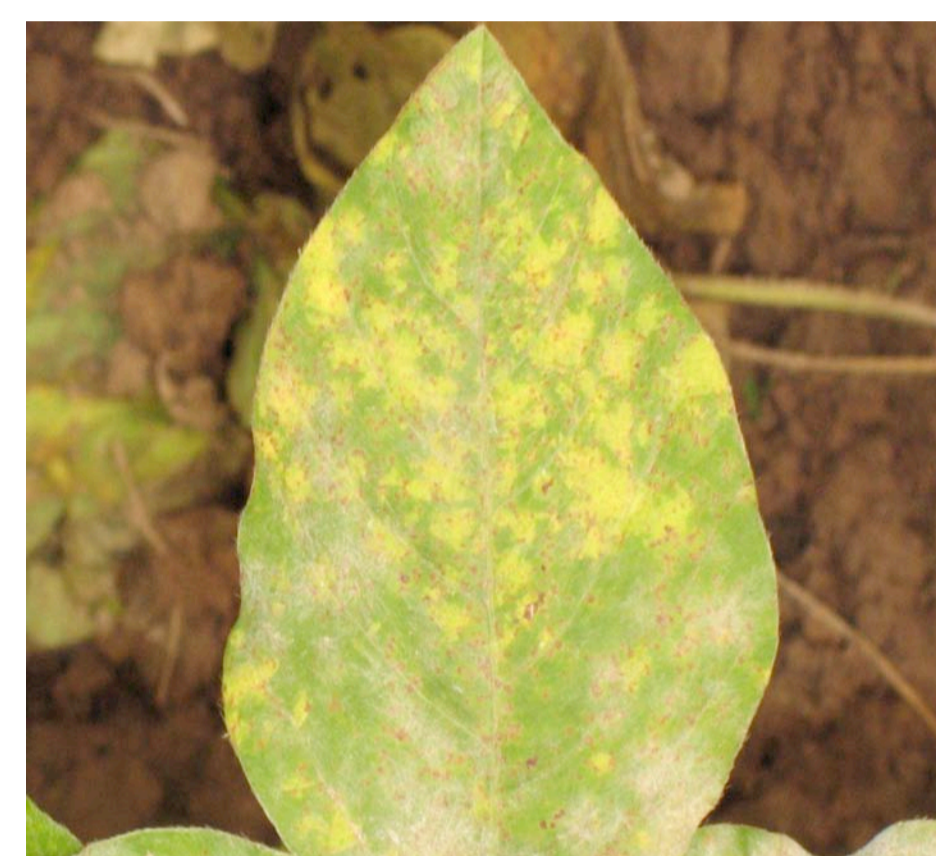
Disease evaluation was carried out 20 days after inoculation. Disease severity of each leaf at every node was assessed 3 times in 10 days interval using a 1-4 scale; 1 = no lesions, 2 = 1-100 lesions, 3 = 100-500 lesions, and 4 = more than 500 lesions. Lesion types; RB-resistant, TAN-susceptible, RB/TAN-mixed and lesion numbers were recorded.

Area under disease progress curve (AUDPC) was computed for each line using the GLM procedure of SAS 9.1 (SAS Institute , Cary NY).

Table 1. Geographical distributions of local soybean lines collected in Vietnam

Location	Plain	Highland	No. of resistant lines
North	35	14	4
Middle	2	-	-
South	17	5	1
Total	54	19	5

Rust symptom on susceptible line



CSIRO resistant line 99084B-30



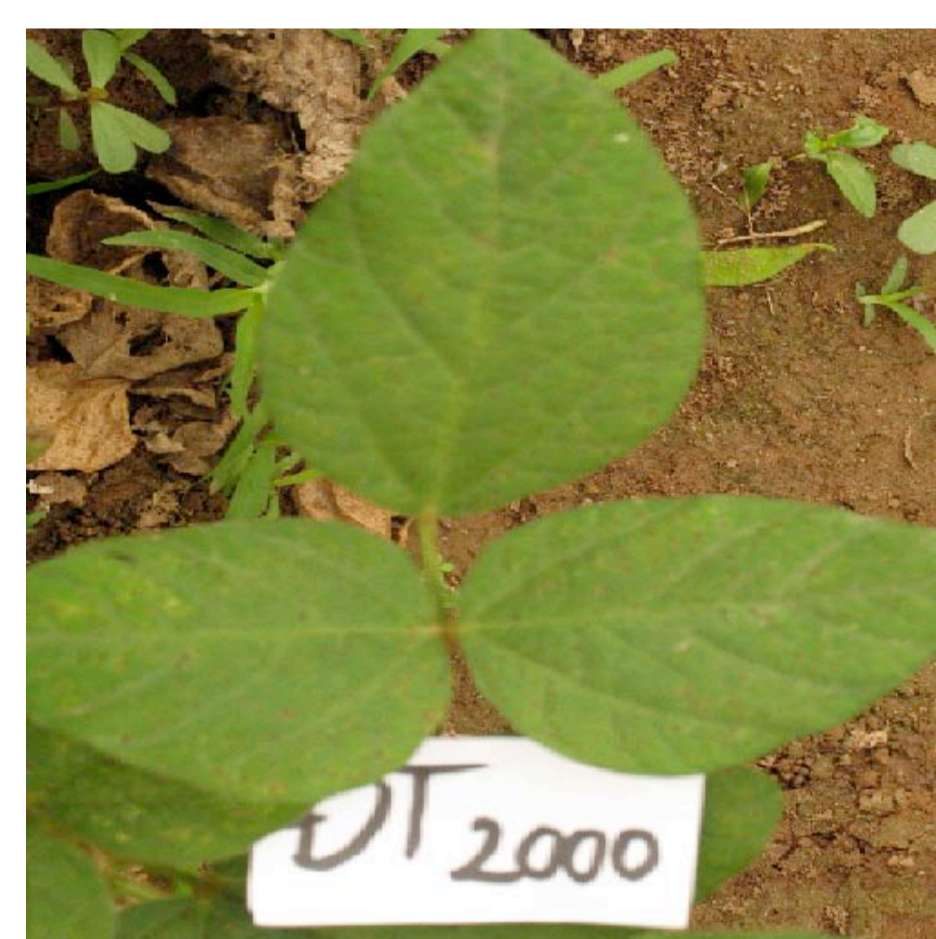
Experimental layout in the Net house



CSIRO resistant line 99084B-28



Resistant check DT2000



Susceptible check DT12



Table 2. Local and commercial lines identified as resistant (having RB reaction) to soybean rust in Spring 2006 at PPRI

No	Local name	MG	Source	Pedigree	AUDPC
1	Nhat Tien Huu Lung Lang Son	IV	Lang Son province	Collected	69.1
2	Dau tuong hat xanh	VIII	Highland in the North	Collected	69.7
3	Bien Hoa 2	III	Bien Hoa province	Collected	64.8
4	Vang Phu nhung	III	Highland in the North	Collected	65.0
5	Vang Muong Khuong	III	Lai Chau province	Collected	64.4
6	DT26	IV	LRDC	DT12xDT2000	55.7
7	DT95	IV	IAG	Mutated AK04	59.7
8	DT96	IV	IAG	DT84xDT90	71.6
9	DT12 (susceptible check)	III	LRDC		74.6
10	DT2000 (resistant check)	IV	LRDC, PRC		55.4
				LSD _{0.05}	0.8

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Table 3. AVRDC and CSIRO lines identified as resistant (having RB reaction) to soybean rust in Spring 2006 at PPRI, Hanoi Vietnam

No	Acc. / Cross No.	Pedigree or Name	Source	AUDPC
1	GC00138-29	(CH#1 x Anoka) x (Clark 63 x 64-4)	AVRDC	52.6
2	GC 86004-9	{ [(Shih Shih x SRF 400) x PI 459025] x (Shih Shih x SRF 400) x (Shih Shih x SRF 400) x (Shih Shih x SRF 400)}	AVRDC	49.0
3	GC 84051-9-1	TN4 x (Shih Shih x SRF 400)	AVRDC	54.8
4	GC 84058-21-4	PI 79 712613 x (PI 79 712613 x SJ)	AVRDC	51.0
5	G 10428	PI 459025	AVRDC	60.2
7	Fikeby 5	Unknown	CSIRO	55.8
8	99084B-28	Unknown	CSIRO	58.7
9	99084B-30	Unknown	CSIRO	56.0
10	99084A-26	Unknown	CSIRO	55.6
11	H173-2	Unknown	CSIRO	56.3
12	DT12 (check)		LRDC	74.6
13	DT2000 (check)		LRDC, PRC	55.4
			LSD _{0.05}	2.4

CSIRO resistant line 99084A-26



DT95 – Commercial variety having RB reaction



RESULTS AND DISCUSSIONS

Eighteen accessions, including commercial varieties DT26, DT95, and DT96, 5 local lines collected in Vietnam, 5 lines each from AVRDC and CSIRO, were identified as resistant. All the lines tested in this experiment showed RB reaction and severity score was equal to or slightly higher than that of DT 2000. Four local lines from Vietnam identified as resistant were collected in highland regions (three from the North and one from the South). These are the valuable potential sources of resistance to soybean rust for future breeding program. Performing inoculation to V2 stage young plants in the screen-house is very effective for screening for new sources of resistance because of high disease pressure, less space, time and labor are required. However, identifying rust resistance in soybean accessions in net house conditions seemed to be more efficient than natural infestation in the field. A number of accessions identified as resistant using this inoculation method were resistant to multi rust isolates (Pham et al, 2006) and all of them showed a consistent resistance when tested in the field in Vietnam.

References

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