ENVIRONMENTAL STRATIFICATION IN TRIALS OF COMMON BEANS IN THE RAINY GROWING SEASON, IN THE STATES OF PARANÁ AND SANTA CATARINA, BRAZIL

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INTRODUCTION

The common bean is submitted to different environmental conditions, since it is grown in several Brazilian States, in different growing seasons (rainy, dry, and winter), under different tillage systems. In this condition it is expected an accentuated interaction among genotypes and environments. This way, the evaluation of common bean lines should be conducted in environmental conditions that better represent the real conditions of the culture and for that it is necessary the implantation of a network of evaluation of trials, involving the main producer states. In Brazil, the States of Santa Catarina and Paraná distinguish in production, together are responsible for about 35% of dry bean national production (IBGE, 2008). The implantation of this network is a procedure quite arduous and expense. The implantation should verify if the sites of evaluation represent the diversity of environments where beans are grow, a specific region, and if specific sites can produce additional information since any redundancy among sites should be eliminated. Therefore, the objective of this work was to apply the procedures of environmental stratification to identify little informative sites when evaluating bean genotypes during the rainy growing season in the States of Paraná and Santa Catarina.

MATERIALS AND METHODS

The trials were conducted in the years of 2003 e 2004 in 12 environments (six sites in each year) in the States of Paraná and Santa Catarina, during rainy growing season (October to December), in randomized complete blocks with three replications and plots with four rows of three meter. Each combination of date of seeding/year was considered a yield. Each trial was composed of 16 genotypes belonging to carioca type (CNFC 9435, CNFC 9458, CNFC 9461, CNFC 9471, CNFC 9484, CNFC 9494, CNFC 9500, CNFC 9504, CNFC 9506, CNFC 9518, CNFE 8009, Carioca 11, Pérola, Iapar 81, Carioca Pitoco and FTS Magnífico). The data of yield of each trial were submitted to analyze of variance and joint analyzes by year. Analyzes of environmental stratification were done following the traditional method by Lin (1982) and by Ecovalence method (Wricke, 1965), using the Genes statistic program (Cruz, 2001). For identification of little informative sites in each year, it were considered the results obtained from the joint methods, that is, sites identified as little informative according to the two methodologies. For identification of the sites to be discharged, it were observed the sites where the results were little informative in two years.

RESULTS AND DISCUSSION

Joint analyzes showed good experimental precision (CV=16% e CV=12%, for 2003 and 2004, respectively) and showed clearly significant differences among sites and genotypes x sites interaction, showing the possibility of using analysis of environmental stratification.

Analyze of stratification by Lin (1982) method in 2003 grouped sites named Campos Novos, Major Vieria and Roncador, indicating that those are similar. Ecovalence analyses showed that sites

with small contribution to interaction were Campos Novos e Roncador (Table 1). Considering the methods in conjunct it can see that the site Campos Novos was grouped by Lin (1982) method and showed small ecovalence estimate. So, Campos Novos was considered the site less informative in this year.

In 2004 the Lin (1982) method grouped the sites Abelardo Luz and Laranjeiras do Sul as similar. Estimates of ecovalence for the sites Laranjeiras do Sul (7%) and Abelardo Luz (8%) indicated that those were the sites less informative (Table 1). Considering the results of both methods, it can be concluded that in this year the lesS informative sites was Laranjeiras do Sul, since it was grouped to Abelardo Luz by Lin (1982) method and presented small ecovalence estimate.

In order to ensure the identification of the sites little informative, it is recommended to identify those in different growing seasons, throughout the time. This did not occurred, since each year of evaluation it was identified a different site considered low informative: Campos Novos in 2003 and Laranjeiras do Sul in 2004. So, the results suggest that among the sites evaluated in the States of Paraná and Santa Catarina does not exist any site passive of being eliminated from the network of evaluation trials of common beans carioca type. However, it is worth to mention that not all sites were replicated in each year. This decreases the chance of identification of low informative sites in several years. Among the sites evaluated, Ponta Grossa, Abelardo Luz and Major Vieira, were always between the informative sites, confirming that they should stay in the nework of evaluation.

Table 1. Estimates of Ecovalences (W) for sites where trials with common beans were conducted, during rainy season in 2003 and 2004, in the States of Paraná and Santa Catarina, Brazil.

| Site | Growing Season | | | |
| | 2003 | | 2004 | |
	W^1	%	W	%
Ponta Grossa	4,448	12	8,982	36
Campos Novos	1,203	3	3,581	16
Abelardo Luz	8,165	23	2,048	8
Major Vieira	4,708	13	3,902	16
Concórdia	15,981	44	-	-
Roncador	1,748	5	-	-
Laranjeiras do Sul	-	-	1,711	7
Londrina	-	-	4,215	17
Total	36,255	100	24,441	100

$^1(x10^3)$

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