Buenos Aires, Argentina.

IEGEBA-CONICET and LACyE (Departamento de Ecología, Genética y Evolución, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires).

Knobs number variability in Argentine Andean maize populations (races Amarillo Grande y Garrapata)

Fourastié MF*, MF Realini, L Poggio and GE González

* florenciafou@yahoo.com.ar

In this work we studied six populations belonging to two races of maize native of northwestern Argentina (NOA) in order to analyze the variation respect to the number of heterochromatic blocks (knobs), using fluorescent banding techniques (DAPI banding).

Cámara Hernández *et al.*, 2011 (Razas de maíz nativas de la Argentina. Ed. Facultad de Agronomía, 168pp.) identified and described 28 native maize races from NOA. Two of these races, Amarillo Grande and Garrapata, differ by their morphological maize ears and grains, and grow at different altitudes in the provinces of Jujuy and Salta (Argentina).

Zea taxa with 2n = 20 chromosomes are variable in number, size and position of the knobs, which can be found in 34 different chromosomal positions in corn and teosinte (Kato, *Mass. Agr. St. Re. Exp. B.* 635:1-185, 1976; McClintock, *Maize Breeding and Genetics* 59-184, 1978). This variability was used for the characterization of maize races of Latin America (Grobman *et al.*, 1961. NAS-NRC, 375 pp.; Longley, *J. Agron. Res* 56:177-195, 1938; Ramírez *et al.*, 1960. NAS-NRC, 159pp; Wellhausen *et al.*, 1957. NAS-NRC, 138 pp.). Number and size variations of the knobs are related to intra and interspecific differences in DNA content found in the genus *Zea* (Tito *et al., Theor. Appl. Genet*. 83:58-64, 1991; Rosato *et al.*, *Am J. Bot*. 85:168 - 174, 1998, Poggio *et al*., *Ann. Bot.* 82:115-117, 1998, Laurie & Bennett, *Heredity* 55:307-313, 1985).

In this work, we studied the number of knobs, using DAPI chromosome banding (Summer, 1990. Chromosome banding. Ed. Unwin Hyman, 434 pp.) on interphase nuclei and mitotic metaphases. The studied materials were collected in the province of Jujuy, Argentina.

These materials has been provided by the Vavilov Lab. of Universidad de Buenos Aires (UBA), and cultivated in the greenhouse of the Facultad de Agronomía, UBA.

We analyzed the number of knobs on populations cultivated at three different altitudes above sea level of Amarillo Grande race (populations: VAV 6669: 2000 m., VAV 6644: 2020 m. and VAV 6636: 2755 m.) and Garrapata race (populations: VAV 6661: 2192 m., VAV 6662: 2780 m. and VAV 6626: 2795 m.). In each population 25 individuals were studied (5 individuals per maize ear) and the results were averaged from at least 20 cells per individual.

The results were analyzed by analysis of variance (ANOVA) with full nesting for general linear mixed models. Factors considered were **race** (fixed factor), **population** growing at different altitudes (random factor) nested on race, and **maize ear** (random factor) nested in the population growing at different altitudes. Additionally, we calculated the variance components to population, maize ear and error factors (variability in the number of knobs between individuals and measurement errors), $p < 0.05$ values were considered significant. All statistical analyzes were performed using the statistical program Infostat, FCA, National University of Córdoba (Di Rienzo *et. al.*, InfoStat version 2012) with the R program interface (R Core Team, R Foundation for Statistical Computing, 2012) for this unbalanced nested design.

No significant differences between races Amarillo Grande and Garrapata in relation to the number of knobs were detected ($F_{1;2}=0.47$; $p=0.53$). However, we found a significant contribution to the variability between populations of the same race cultivated at different altitudes above sea level (CI: 0.46^2; 4.89^2). We also found a significant contribution to the variability among maize ears of the same population (CI: 0.55^2; 1.67^2). Notwithstanding, differences among populations belonging to each race cultivated at different altitudes were detected. Of the total variability, 45% is due to the variability among populations and 36% is attributed to variability between the maize ears (Table 1).

Figure 1 shows a significant decrease in the knobs number in populations cultivated at higher altitudes, in concordance with the results found in other NOA populations (Rosato *et al.*, *Am. J. Bot*. 85: 168-174, 1998).

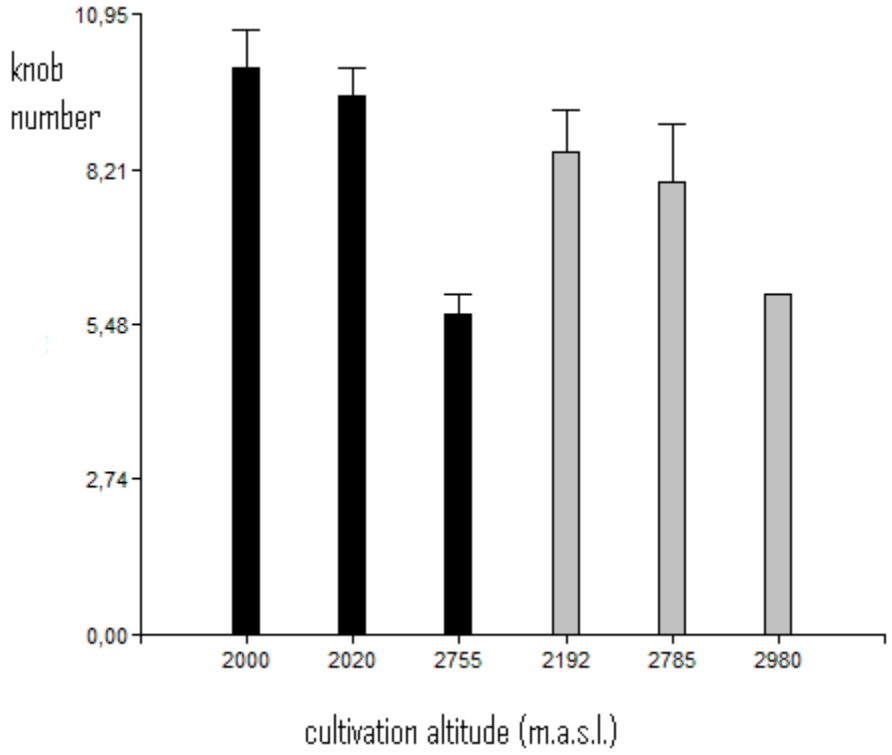

Figure 1. Knobs number of populations of Amarillo Grande (black) and Garrapata (gray). Mean and standard deviation. Ref.: m.a.s.l.: meters above sea level.

Factors	Estimated variance	CI for variance	Variability relative to the total (%)
Population	$\sigma^2_{ALT}=1.50^2=2.25$	$(0.46^2; 4,89^2)$	45.0
Maize ear	$\sigma^2_{Esp}=1.35^2=1.82$	$(0.68^2; 2,71^2)$	36.5
Error (individuals)	$\sigma^2_{Esp}=0.96^2=0.92$	$(0.55^2; 1.67^2)$	18.5

Table 1. Estimated variance components. CI: Confidence intervals.