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COMPARATIVE STUDY OF ZEA KARYOTYPES

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The taxa of genus *Zea*, maize and teosintes, have both intra and interspecific variation in its genome size, due to differences in heterochromatin content (Tito *et al*. *Theor. App. Genet.* 83:58-64, 1991; Poggio *et al*. *Ann. J. Bot.* 82:115-117, 1998). The heterochromatin mainly forms telomeric or subtelomeric blocks called knobs (Kato, *Mass. Agric. Exp. Stn. Bull*. 635: 1-185, 1976).

A comparative analysis of the karyotypes of different taxa of genus *Zea* is presented. In addition, we studied the karyotype variation in the percent and location of heterochromatic regions, and discuss the inter and intrachromosomal asymmetry for each karyotype.

C and DAPI banding techniques were applied on mitotic metaphases chromosomes of *Zea luxurians* (cv. 2228, Guatemala), *Zea mays* ssp. *mexicana* (KG-04-2, Mesa Central, México), *Zea mays* ssp. *parviglumis* (cv. 8391, Balsas Valley, Guerrero, México), *Zea diploperennis* (cv. 2232, San Miguel, Jalisco, México) and the Argentinean race of maize Orgullo Cuarentón (VAV 6482, Lab. de Recursos Genéticos Vegetales I. N. Vavilov, Facultad de Agronomía, UBA). Chromosomal parameters were measured with MicroMeasure 3.3 (available in http: //www.colostate.edu/depts/biology/micromeasure). Chromosomes were ordered from the largest to the smallest, as usual for maize, classified according to the nomenclature of Levan *et al*. (*Hereditas* 52:201-220, 1964), in order to facilitate comparison with related grasses. Intra and interchromosomal asymmetry indexes (A1 and A2) were calculated according to Romero-Zarco (*Taxon* 35:526-530, 1986).

Table 1 present the karyotypic formulae, the intra and interchromosomal asymmetry indexes, the percent of heterochromatin and the DNA content (2C).

Figure 1 shows the representative mitotic metaphases, the idiograms and the karyotypic formulae of each analyzed taxa.

The results of DAPI banding showed that *Z. luxurians* is the species with the highest number and size of heterochromatic knobs, which is related to the higher percent of heterochromatin and chromosomal size observed in this species. Moreover, karyotype formulae variation was detected between the studied taxa, mainly due to the differences in the number and position of the heterochromatic knobs.

In relation to the symmetry of karyotypes it was noted that *Z. diploperennis* has the most asymmetrical karyotype with high levels of intra and interchromosomal asymmetry, while *Z. luxurians* has elevated intrachromosomal asymmetry but low interchromosomal asymmetry. Moreover, *Z. m.* ssp. *mexicana*, *Z. m.* ssp. *parviglumis* and maize Orgullo Cuarentón race vary in both asymmetry indices (A1 and A2). This variation is not directly related with the DNA content or the percent of heterochromatin, but depends on the heterochromatin distribution. Therefore, the greatest asymmetry observed in *Z. diploperennis* karyotype is due to the heterochromatin distribution mostly on the long arms of chromosomes.

These results indicate that in genus *Zea*, the formulae and symmetry of the karyotypes depends on the number, size and position of the heterochromatic regions.

	Karyotype formulae	**A1**	**A2**	**% heterochromatin**	**ADN amount (2C)**
Z. luxurians	5m+4sm+1sm-st	0.39	0.15	21.16	8.83 pg *
*Z.m.*ssp. *parviglumis*	9m+1st	0.24	0.24	18.75	5.86 pg ◘
*Z.m.*ssp. *mexicana*	n/d	0.38	0.23	n/d	7.09 pg *
Z.diploperennis	5m+4sm+1st	0.44	0.37	8.5	6.36 pg *
Maize (Orgullo Cuarentón)	9m+1sm	0.21	0.23	7.84	6.15 pg #

Table 1: Formulae and karyotypic parameters. A1: interchromosomal asymmetry index. A2: intrachromosomal asymmetry index. Ref.: m: metacentric. sm: submetracentric. st: subtelocentric. pg: picograms. n/d: no data. *: From Tito *et al*. (1991). ◘: Poggio and Guillín, personal comunication. #: From Rosato *et al*. (1998).

Figure 1: Mitotic metaphases, idiograms and karyotypic formulae of each *Zea* taxa analyzed. Bar: 10 µm.