Cytology of Diploids, Natural and Induced Tetraploids, and Intraspecies Hybrids of Bahiagrass, *Paspalum notatum* Flugge

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DIPLOID Pensacola bahiagrass (2n = 20), discovered growing wild near Pensacola, Florida, is one of the most popular perennial pasture grasses in Florida and the southern part of the rest of the Gulf States. More limited use has been made in the United States of broader leaved, more palatable but less winterhardy, tetraploid (2n = 40) types such as common bahiagrass and the Argentine variety. The breeding program at Tifton, Georgia, aimed at producing improved bahiagrass pasture varieties, is complicated by the presence of polyploidy and apomixis (at the tetraploid level and above) in the species. In the past, the apomictic mode of reproduction of desirable tetraploid types and hybrids between sexual diploids and apomictic tetraploids (5) restricted the breeder's use of the germ plasm in this predominantly tetraploid species. Recently, the apomictic barrier to recombination of characters in natural tetraploids was broken by hybridization with sexual, induced tetraploids of Pensacola bahiagrass (7). Although somatic chromosome numbers have been reported for a number of biotypes and hybrids in this species, very little information regarding their meiotic behavior exists in the literature. The present paper concerns cytological observations on chromosome numbers and meiosis in various plant materials important to the breeding program at Tifton.

REVIEW OF LITERATURE

Bahiagrass, *Paspalum notatum* Flugge, is native throughout much of Latin America, where it is a major pasture species (8, 12). According to Parodi (12), the probable center of origin of bahiagrass and its greatest morphological diversity occur in south Brazil, Paraguay, northeast Argentina, and Uruguay. Several biotypes of this species have been introduced into the United States in ship ballast, by experimental plant introduction, and through commercial seed channels. Burton (3, 5) and others (10) described the major biotypes present in the United States. Hitchcock (11) listed one variety, var. *saurae* Parodi, and stated that, "It has been called the Pensacola strain."

Burton (3) determined the somatic chromosome number of the Pensacola strain as 2n = 20. He also found 2n = 20 for P.J. 149303 from Argentina. Similarly in chromosome number and plant morphology of these two strains suggested that Pensacola also originated in Argentina (6). Saura (15) observed n = 10 in pollen mother-cells of a bahiagrass accession from Concepcion del Uruguay (Entre Rios). He published a photomicrograph of diakinesis showing 10 II and indicated that the pollen was 90% fertile. Pensacola is taller, has longer, narrower leaves, and spreads faster than common and most other bahiagrass introductions (6). It reproduces sexually and is highly cross-pollinated, and most plants are highly self-sterile (6).

Burton, (2, 3) found 40 somatic chromosomes in several plants each of 5 naturalized or introduced biotypes including common. Saura (15) found 2n = 40 and n = 20, respectively, in accessions from Tucuman and Cordoba, Argentina. His photomicrograph of a diakinesis cell in the latter accession shows 20 II. Burton (4) found that common bahiagrass reproduced principally by apomixis (unreduced pseudogamy). Chromosome-number determinations in the few hybrids produced in that study indicated that the eggs and pollen which functioned in Pensacola were reduced. Thus, hybrids with 30, 50, and 60 chromosomes were obtained for Pensacola × common, common × Pensacola, and common × common, respectively. Although the hybrids produced seed in the presence of a good pollen source, they were apomictic (5). Burton and Forbes (7) found that aposporous was a feature of apomixis in bahiagrass.

MATERIALS AND METHODS

Either chromosome number alone or chromosome number and meiotic behavior were studied in 31 bahiagrass clones. For the sake of brevity, plants will be identified by the symbols indicated in parentheses in the descriptions of the plant materials in this section.

**Diploids**—Chromosome numbers and meiosis were studied in six experimental clones from several seed accessions of Pensacola bahiagrass (PB). The clones carried the test numbers 1, 14, 108, A-3, SCS-2513, and S-III-1. Progeny tests of these accessions indicated that they reproduce sexually.

**Tetraploid hybrids**—Chromosome numbers and meiosis were studied in the hybrid clone Pensacola × common 28-61 (PB × CB 28-61) and two hybrid clones of the cross Pensacola × prostrate common bahia (PB × PCB) which carried the numbers 5-10 and 17-12. Progeny tests indicated that PB × CB 28-61 is an obligate apomict.

**Induced tetraploids**—Chromosome numbers and meiosis were studied in 10 induced tetraploid clones of Pensacola bahiagrass (PT), the clones carrying the numbers 2, 4, 5, 6, 7, 8, 9, 10, 11, and 12. Progeny tests and/or cytological observations of sexual × apomictic hybrids indicated that all the induced tetraploids are sexual (7 and unpublished data).

**Natural tetraploids**—Chromosome numbers and meiosis were studied in seven clones: A short broad-leaved type called "common bahiagrass" carrying the recessive character, white stigma (WSB); a common bahiagrass from Cuba (CCB); a long, broad-leaved type from Paraguay, P.J. 158822 (PAR); a long, broad-leaved type from Uruguay, known as "Monzon Heber 621" (MH); a long, broad-leaved agronomic variety named Argentine, formerly P.J. 146996 (AR); a type with narrower leaves of intermediate length from Uruguay, P.J. 155105 (UR); and Wilmington bahiagrass, SCS-20-388 from Wilmington, North Carolina, which has narrower leaves sharply folded at the midrib (WL). Chromosome number alone was determined in a clone of the Puerto Rico introduction C-65. Progeny tests of all these accessions except UR (which has not been tested) indicated that they are obligate apomicts.

**Tetraploid hybrids**—Chromosome numbers and meiosis were studied in four hybrid clones of sexual, induced tetraploid Pensacola...