

Chromosome number and morphotype of *Sporobolus virginicus* from coastal North West Western Australia

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Abstract

Smith-White, A.R. & Adam, P. Chromosome number and morphotype of *Sporobolus virginicus* from coastal North West Western Australia. *Kingia* 1(4): 321-325 (1990). Chromosomal numbers for the four morphotypes of *Sporobolus virginicus* recognized by Smith-White are reported from coastal North West Western Australia. These comprise diploid, tetraploid, pentaploid and hexaploid populations. It is shown that eight morphological and chromosomal races are present in the region. Possible adaptation by these races to edaphic and latitudinally related factors, such as seasonality of rainfall and daylength, is discussed.

Introduction

Sporobolus virginicus (L.) Kunth is a perennial grass with a cosmopolitan distribution in tropical and sub-tropical saltmarshes. In the report by Smith-White (1988) on the occurrence and distribution in coastal Australia of morphological and chromosomal races of *S. virginicus*, diploid, triploid, tetraploid, pentaploid and hexaploid chromosome numbers were determined on base $x = 10$ and four morphotypes were recognised (see Table 1). Morphotypes differed in relative robustness, dimensions of leaf blades and the projection angle of leaf blades with stem. For the section of coast north of Hutt Lagoon in Western Australia, however, only three locations were sampled. At Broome and at Wyndham the grass was found to be tetraploid with fine leaves and stems and at Roebourne it was pentaploid with leaves and stems comparatively more coarse. The former two specimens were both classified as morphotype one and the latter as morphotype two. At Hutt Lagoon and at the mouth of the Greenough River both diploid and pentaploid races were found (Smith-White & Adam 1988); further south the population was uniformly diploid (Smith-White 1988).

Methods

As pointed out in Smith-White (1988) further sampling would be necessary to establish the number of genetic races extant in North West Western Australia. To this end, nineteen additional samples were collected by Paul Adam during a trip to the region in June 1987. Cuttings from these were propagated in sand in individual containers in glasshouses at the University of New South Wales and chromosome squash preparations were made from young roots using standard techniques (see Smith-White 1988). The morphotype of collections was assessed from specimens lodged in the J.T. Waterhouse Herbarium, University of New South Wales (UNSW) using the criteria listed in Table 1. Duplicates of the specimens have been lodged in the Western Australian Herbarium. Table 2 provides details of the collections. Figure 1 shows mean annual rainfall and the distribution of genotypes in North West Western Australia.

Discussion

Tetraploids with type 1 morphology were the most commonly collected, extending from Wyndham south to Carnarvon. Type 3 plants were only found in the far north of the State, and these included both tetraploid and hexaploid forms. The type 3 morphotype, with long narrow leaves (<20 cm x 1-2 mm at ligule) has also been found in the Northern Territory and in northern Queensland but is not known at higher latitudes (Smith-White 1988). Occurrences of the very robust, morphotype 4 tetraploid at Cape Keraudren near Port Hedland and at Crystal Head in Admiralty Gulf extend significantly the known range of this form. Morphotype 4 plants (leaves <7 mm wide at base of blade) are common in sandy habitats in eastern and northern Australia but had not previously been collected in Western Australia.

Earlier, in an ecological survey of the 80-mile Beach area, Burbidge (1944) reported the occurrence of two growth forms of *S. virginicus* at Anna Plains, south of Cape Missiessy; one tufted and mat forming, 20-30 cm high which she called "Salt Grass", and the other with long trailing culms often more than 3.5 metres in length which she called "Coastal Couch". Burbidge attributed the observed variation in phenotype as a plastic response to ground salinity but the two forms may in fact have been morphotypes 1 and 4 as here discussed.

Sporobolus virginicus has also been collected previously from Shark Bay (Oldfield, Milne in Gardner 1952) but inspections of saltmarsh habitats around Hamelin Pool in Shark Bay in 1987 failed to determine its presence. Its distribution in this area may be limited by the low rainfall and resultant high salinities developed in the local marshes. In South Australia *S. virginicus* (diploid) is not found in areas with less than 500 mm annual rainfall (Smith-White 1988). The change from winter to summer rainfall maximum about mid way between Carnarvon and Port Hedland may also limit the occurrence of *S. virginicus* in the region. Except for coastal New South Wales, where rainfall is fairly uniform throughout the year, polyploids are only known from the summer rainfall zone. The establishment of tetraploids south of Carnarvon may therefore be limited not only by low annual rainfall but also by the fact that it falls predominately in the winter.

Notwithstanding the relatively sparse distribution of *Sporobolus* from this part of Australia, similarities in the distribution of ploid levels and morphotypes with that along the eastern seaboard are evident and suggest adaptation by these races to some latitudinally related factors (e.g. to seasonality of rainfall, daylength, etc.). The occurrence in the west of pentaploids is analogous to that of the triploid hybrid of south-eastern Australia. However whilst hybridisation between diploid and tetraploid on the east coast generally appears to have involved normal gametic reduction (the presence of a number of tetrasomic triploids with 31 chromosomes indicates reduction was not always regular), the pentaploid hybrids most probably resulted from the union of normally reduced diploid and unreduced tetraploid gametes. Hexaploids, because of their restriction to low latitudes, seem unlikely to have been involved in pentaploid origins.

Two instances of triploidy in *Sporobolus virginicus* have been recorded elsewhere in the world (de Wet 1960, Gould & Soderstrom 1970) but all other chromosome counts have been diploid. This apparent absence of polyploidy outside Australia may simply be a reflection of the low number of chromosome counts made, or it may indicate that the Australian complex is unique and has evolved independently of populations in the rest of the world.

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2n	morphotype	symbol
20	1	○
20	2	●
40	1	□
40	3	⊠
40	4	■
50	1	☆
50	2	★
60	3	◇

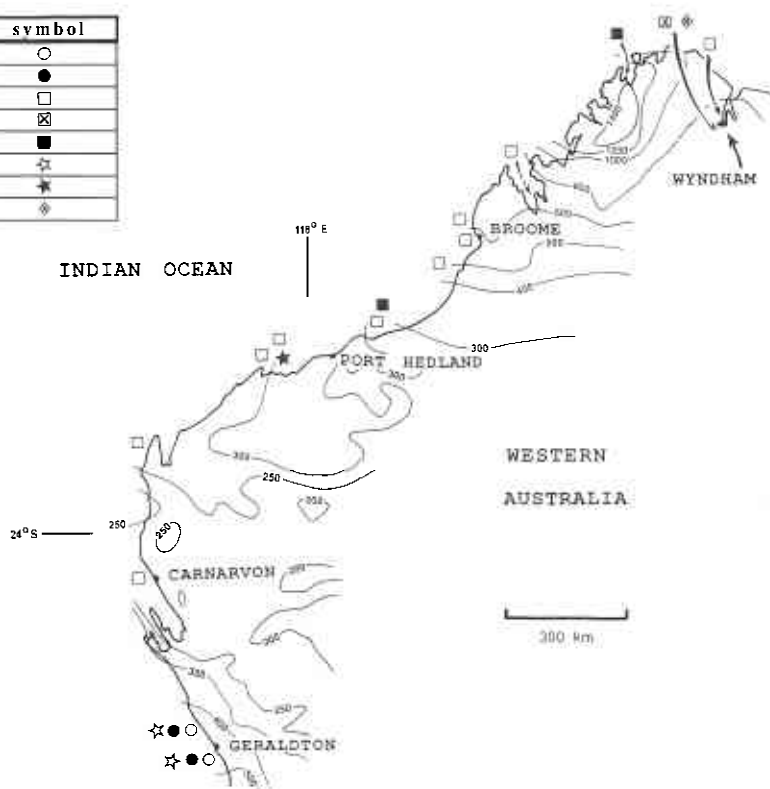


Figure 1. Ploid level and morphotype of *Sporobolus virginicus* from North West Western Australia. Average annual rainfall isohyets from Canterford (1987).

Table 1. Description of four morphological variants of *Sporobolus virginicus* (L.) Kunth

Morphotype	General form	Height	Leaf blade width*	Leaf blade length	2n [#]
1	Generally erect, sometimes decumbent and mat-forming; leaf blades projecting at 50-90° to stem.	3-40 cm	1-2 mm	<7 cm	20, 30, 40, 50, 60
2	Similar to morphotype 1 but more robust	3-40 cm	2-3 mm	<7 cm	20, 50
3	Erect, tall; long narrow leaves which remain compressed to stem at proximal end.	30-40 cm	1-2 mm	<20 cm	40, 60
4	Very robust, erect to decumbent; large leaf blades projecting at 50-90° to stem.	10-40 cm	<7 mm	<25 cm	40

* Diploid chromosome number.

* Width measured on blade at ligule.

Table 2. *Sporobolus virginicus* collected from North West Western Australia.

Herbarium voucher no.	Locality	Lat. S	Long. E	2n [#]	Morpho-type
17960, 8085*	Greenough River, mouth	28° 52'	114° 38'	50	1
17961, 8086*	Greenough River, mouth	28° 52'	114° 38'	20	1
8083*	Hutt Lagoon	28° 09'	114° 13'	20	1
8080*	Hutt Lagoon	28° 09'	114° 13'	50	1
17962	Camarvon, upper marsh	24° 53'	113° 40'	40	1
17963	Camarvon, lower marsh	24° 53'	113° 40'	40	1
17975	Tantabiddy Ck, NW Cape	21° 56'	113° 58'	40	1
17976	Mangrove Ck, Cape Range National Park	21° 59'	113° 56'	40	1
17984	Cowie Cove, Dampier	20° 39'	116° 49'	40	1
3103*	Roebourne	20° 47'	117° 09'	50	2
17987	Point Samson	20° 38'	117° 11'	40	1
20606	Cape Keraudren	19° 58'	119° 46'	40	4
20607	Cape Keraudren	19° 58'	119° 46'	40	1
20612	False Cape Bossut	18° 35'	121° 44'	40	1
3688*	Roebuck Bay, Broome	17° 59'	122° 15'	40	1
20617	Willies Ck, N of Broome	17° 45'	122° 13'	40	1

Table 2 (continued). *Sporobolus virginicus* collected from North West Western Australia.

Herbarium voucher no.	Locality	Lat. S	Long. E	2n [#]	Morpho- type
20622	Derby, S side of causeway	17° 18'	123° 37'	40	1
20645	Crystal Head	14° 28'	125° 51'	40	4
20679	Pentecost River Crossing	15° 47'	127° 53'	40	3
20680	Pentecost River Crossing	15° 43'	127° 51'	40	3
20682	Pentecost River Crossing	15° 43'	127° 51'	40	3
20683	King River	15° 39'	128° 05'	60	3
20684, 3684*	Wyndham Jetty	15° 29'	128° 05'	40	1

* Specimens collected prior to 1987 (see Smith-White 1988).

Diploid chromosome number.