

# DIGITARIA SANGUINALIS IN SOUTH AMERICA

JOHN E. EBINGER

*Eastern Illinois University, Charleston, Illinois*

**ABSTRACT.**—The distribution of the north temperate species *Digitaria sanguinalis* (L.) Scop. is extended to southern South America with its tropical equivalent, *Digitaria adscendens* (HBK.) Henrard, occurring further north. This study also reveals that there is a strong correlation between the average winter temperature and the distribution of these two species. Furthermore, in the region of overlap an occasional intermediate plant is found.

At present the common crabgrass *Digitaria sanguinalis* (L.) Scop. is considered to be restricted to the temperate regions of the northern hemisphere and to southern Africa with its morphological similar counterpart, *D. adscendens* (HBK.) Henrard, occurring in the tropical and subtropical regions (Henrard, 1950). Recently a few collections of *D. sanguinalis* from Argentina were found among specimens of *D. adscendens*. Due to this distribution a more thorough study seemed necessary to determine whether a chance introduction of *D. sanguinalis* had occurred or whether a well established population existed in southern South America.

## MATERIALS AND METHODS

The basis of this study was herbarium material and more than 100 collections from South America were examined. The herbarium specimens were separated into two groups using the characteristics outlined by Henrard (1950). Finally, the data were arranged in the form of a scatter diagram, and the collections examined were plotted on a map to show the geographic distribution.

## DISCUSSION RESULTS

**Morphological analysis.** In general growth habit, *Digitaria sanguinalis* and *D. adscendens* are strikingly similar. *Digitaria sanguinalis*, however, has a second glume half as long as the spikelet, spicules on the nerves of the sterile lemma, and cauline leaves heavily pubescent on both surfaces with papillose-based hairs. Typical *D. adscendens*, in contrast, has a second glume that is about two-thirds to three-fourths as long as the spikelet, no spicules and glabrous cauline leaves.

A preliminary morphological examination indicated that the above-mentioned characters could be used to separate these two species in South America. The data derived from this study were plotted on a scatter diagram similar to that described by Ebinger (1962). Two definite groups were found on the graph, one representing *Digitaria adscendens*, the other *D. sanguinalis*. Between these two groups were plants intermediate with respect to the length of the spikelets and second glume. In this part of the graph, the specimens differed completely in the traits of spicules and leaf pubescence. Such plants probably represent hybrids between the two species.

**Geographic distribution.** The results of the morphological analysis were plotted on a map (Figure 1)

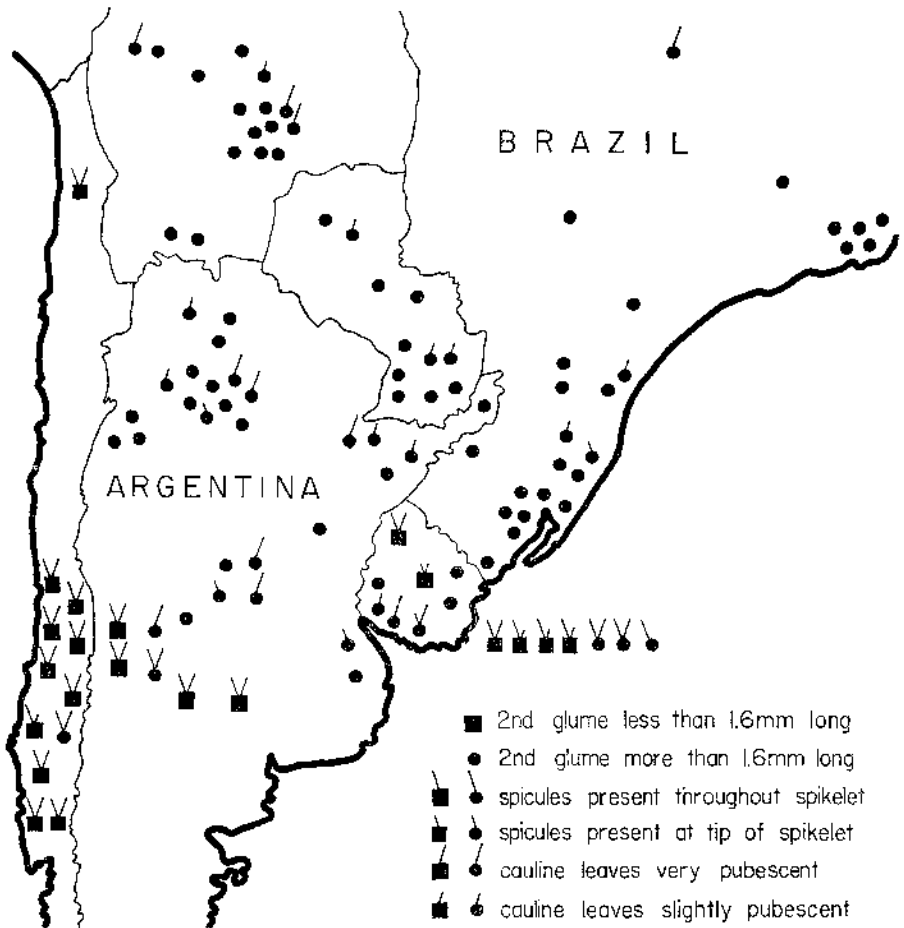


FIGURE 1.—Distribution and variability of *Digitaria ascendens* and *D. sanguinalis* in southern South America.

to determine whether each species had a distinct geographic range. On this map each circle or square represents a single specimen. A square indicates that the length of the second glume was less than 1.6 mm while a circle indicates that the second glume was longer than 1.6 mm. A long bar radiating to the left indicates that there are spicules all along the nerves of the sterile lemma, while a short bar indicates

that a few spicules are found on the lemma nerves near the tip. A long bar radiating to the right indicates that the cauline leaves are pubescent throughout on the upper and lower surfaces, while a short bar indicates that a few hairs are present, usually on the lower surface near the base of the blade.

It seems significant that *Digitaria sanguinalis* (represented by squares with two long bars) is common

throughout Uruguay, central Argentina and all of Chile while *D. adscendens* (represented by circle without bars) is very common further north. Numerous specimens of this species were found in Brazil, Paraguay, Bolivia, and northern Argentina. The circles with bars radiating from them and the squares without bars or short bars show various degrees of intermediacy between the two species.

Most of these intermediate types are similar to *D. adscendens*, differing only in having papillose-based hairs on the culm leaves (line radiating to the right). These plants which are common in northern Argentina, southern Brazil and Uruguay may indicate gene flow between the two species. However, due to the total exclusion of *D. sanguinalis* in some of these areas, it is also possible that this character represents normal variation within *D. adscendens*. It should be mentioned that the frequency of pubescent culm leaves is less in the members of this species found in northern South America. The remaining characteristic (spicules) seems to indicate introgression of characters between the two species. Plants with this characteristic are almost exclusively restricted to the geographic region of overlap, which includes Uruguay and the central and northern part of Argentina. Such specimens are difficult to place taxonomically and probably represent hybrids.

*Factors responsible for species distribution.* Because the two species can be separated and since each has a distinct geographic range, an attempt was made to determine what factors were responsible for this

distribution. The only phenomenon with which geographic distribution could be correlated was temperature. The northern limit of *Digitaria sanguinalis* in South America is the region in which the average July temperature is about 45° to 50° F. Byers (1959) shows these isotherms extending through southern Uruguay and central Argentina which is the region in which the intermediate plants were found. Although these isotherms also extend through central Chile, no specimens of *D. adscendens* or intermediate plants were found in the northern part of this country.

It is interesting to note that the distribution of *Digitaria adscendens* and *D. sanguinalis* in North America is correlated with the 45° to 50° F. January isotherms. On a distribution map of these two species (Ebinger, 1962), *D. sanguinalis* is found to the north of these isotherms while *D. adscendens* occurs to the south. Along the region of overlap many intermediate plants are found.

No attempt was made to determine the distribution of these two species in Africa. Chippindall (1955), however, mentions that *D. adscendens* is confined to the north and eastern parts of the Union of South Africa while *D. sanguinalis* is found in the southern and western regions. He further states that a few plants from the north-eastern Cape are somewhat intermediate between these two species. The mean surface isotherm map (Byers, 1959) shows that the average July temperature for South Africa is between 50° and 60° F., much warmer than that found where *D. sanguinalis* oc-

curs in the western hemisphere. The map further shows that the temperatures in the eastern and northern parts of South Africa are warmer by almost 10 degrees than those found in the southern and western parts. This temperature variation is probably responsible for the distribution of *D. sanguinalis* in this part of South Africa.

#### CONCLUSION

There is a strong correlation between the 45° and 50° F. isotherms and the distribution of *Digitaria sanguinalis* and *D. adscendens* in South America. *Digitaria adscendens* occurs to the north of these isotherms and *D. sanguinalis* to the south. In the region of overlap (between the 45° and 50° F. isotherms) some intermediate plants occur. Both parental species are also common in the overlap region which shows that, in spite of probable hybridization, there has been little tendency toward the amalgamation of these two species. This indicates that at least a partial sterility barrier exists, or that other factors are preventing excessive hybridization and backcrossing.

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#### REPRESENTATIVE SPECIMENS

*Digitaria adscendens* (HBK.) Heurard  
 ARGENTINA: A. L. Cabrera 1986; A. T. Hunziker 492; M. M. Job 699; P. Jorgensen 1260; F. Kuntz 8910; G. Mazer

4678; M. R. Malvarez 552; L. Monetti 1509, 1861; C. A. O'Donnell 185; Tito & Ybarrola 1884, 2905; S. Venturi 2153, 2682, 2786, 3329, 7140.

BOLIVIA: Britton & Rusby 264; O. Buchtien 418, 444, 3654, 5318, 6439, 6440, 7126; A. S. Hitchcock 22606, 22839; H. H. Rusby 245, 675; J. Steinbach 1978, 6839, 6848, 7057.

BRAZIL: Agnes Chase 10966, 16168, 16756, 11311; F. C. Hoehne 241; C. Jürgens 3; C. A. Lindman 1335; F. O. Paulo 241; B. Rambo 30771, 40669, 40979; E. Raupp 125, 174, 184, 217; Reitz & Klein 698, 3104; B. Rosengurtl 3393, 3308, 3359, 3420; Smith & Reitz 9744; A. P. Viegas 2150.

PARAGUAY: P. Jorgensen 3548, 4100; T. Rojas 12597, 13003, 13842, 13863; B. Rosengurtl 5498, 5625, 5752.

URUGUAY: W. Herter 18822; B. Rosengurtl 4557, 5141, 5707. *Digitaria sanguinalis* (L.) Scop.

ARGENTINA: O. Paci 652; R. A. Reitz Leal 2839; A. G. Schultze 6089.

CHILE: O. Buchtien 109; H. Günckel 5811; A. S. Hitchcock 22935; L. Jorguera (18 Feb 1949); C. Joseph 934, 2337, 3361; R. A. Philippi 376.

URUGUAY: Berro 3311, 5033, 7322, 7872; W. Herter 68142; Eva M. March 52; B. Rosengurtl 1508, 7716.

#### SPECIMENS INTERMEDIATE BETWEEN THE TWO SPECIES

ARGENTINA: O'Donnell & Rodriguez (12 Mar 1944); J. M. Rodriguez 39157; T. Stuecker 69.

BRAZIL: Reitz & Klein 2783.

URUGUAY: W. A. Archer 4976; W. Herter 99487.

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- HENRARD, J. T. 1950. Monograph of the genus *Digitaria*. xii + 999 pp. Leyden, Universitaire Pers Leiden.
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