Variations in Mimosine Content Among Leucaena Species and Related Mimosaceae

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STRAINS of the genus *Leucaena* (Mimosaceae) serve as high protein forage and shade plants throughout the tropics. A major limitation to their cultivation is provided by the alkaloid, mimosine, which causes several toxic symptoms in animals, including loss of hair in nonruminants and reduced egg production in poultry. A world collection of *Leucaena* strains has been assembled in Hawaii to facilitate biochemical and breeding studies aimed at the production of low mimosine or mimosineless forms. This report summarizes the results of mimosine analyses of these strains and of related mimosaceous genera.

*Leucaena* is a genus of subtropical and tropical woody legumes allied closely to the genus *Mimosa*. Central American in origin, it consists of perhaps a dozen valid species. The most widespread and important of these is *L. leucocephala* (Lam.) de Wit, formerly known (2) as “L. glauca”, widely recognized by forage breeders as a potential “alfalfa of the tropics” (3). It is used also as a windbreak and shade plant for crops like coffee and cacao. Aggressive on soils that are not too acid, it may attain heights of 40 ft. and is dominant in the vegetation of many drier parts of the tropics.

Mimosine, β-[N-(3-hydroxy-4-pyridone)] α-aminopropionic acid, has been extracted from *L. leucocephala*, and was first reported from *Mimosa* spp. (8). The pyridone portion of the molecule has been shown to be derived biosynthetically from the amino acid, lysine (5, 6). Mimosine causes severe depilation in animals, the short tails of tropical horses usually tracing to this cause. Depilation is less evident in ruminants, due to bacterial degradation. Specific rumen bacteria have been isolated which can utilize mimosine as their sole source of carbon (6). The cultivation of *Leucaena* strains has been curtailed largely because of mimosine’s deleterious effects.

MATERIALS AND METHODS

Twenty-five plants were grown from each of 2 stations in Hawaii. Most were uniform, reflecting the high rate of self-pollination (4). The accessions included, in addition to the species *L. esculenta* (Moc. and Sesse) Berth. (Schlecht) Benth, *L. leucocephala* S. Wats., and a strain referred to as “L. buitenzorg” which was distinct from the trial. While some duplication of strains in the trial. While some duplication of strains in the strains were from locations in which the shrub had become widely naturalized.

Mimosine analyses were made of leaf and seed samples using a modification of the method of Matsumoto and Sherman (7). Three separate mimosine determinations were made of individual plants, using composite samples of leaves substituted from all plants at a given location. Observations involved six-week old seedlings of 63 strains; mimosine values from these seedlings correlated well (r = 0.570, P < .01) with data from the mature plants. Mimosine determinations were made of individual plants in order to assess inter-plant variability, for which the coefficient of variation was 16.6%. All data were pooled for the analysis summarized in Table 1.

RESULTS

All 72 *Leucaena* strains reacted positively for mimosine; no single plant was found to be free of the alkaloid. Mimosine contents averaged about 4% dry weight (37.52 ± 0.85 mg./g.), and ranged from 18.9 mg./g. to 48.9 mg./g. in the strains tested (Table 1). Three separate mimosine determinations were made of individual plants of 63 strains from locations in Hawaii, including those from South America (avg. 23.1 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 23.1 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine contents averaged about 4% dry weight (37.52 ± 0.85 mg./g.), and ranged from 18.9 mg./g. to 48.9 mg./g. in the strains tested (Table 1). Three separate mimosine determinations were made of individual plants of 63 strains from locations in Hawaii, including those from South America (avg. 23.1 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 23.1 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.” Mimosine values were obtained for 4 strains of *L. pulverulenta* (avg. 22.2 mg./g.), for which a world collection was made which included 4 strains from Indonesia hybrids of *L. pulverulenta* (avg. 22.2 mg./g.), and 1 accession referred to as “L. buitenzorg.”