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5. The reduction in numbers of coliform organisms is quite good at the stabilization lagoon effluents, the picture of coliform density adhering quite closely to what one would expect in a "normal" system, exhibiting high summer counts, low winter counts, and intermediate spring and fall counts.

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Studies of Arundinaria: Experimental Induction of Flowering and Additional Observations in the Field

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ABSTRACT

Arundinaria has been observed for three successive seasons at a site near Amity, Arkansas. In advance of the 1971 flowering period rhizomes were taken from the field, pruned, and placed either in an environmental chamber or in the greenhouse in water or in sandy soil. Flowering occured under each condition, but was most rapid and profuse in transplants growing in sandy soil in the greenhouse. Observations point to the possibility of induction of flowering or to the possible existence of an annually flowering race. Possible economic uses are considered.

In my first paper on the flowering of our native bamboo, **Arundinaria gigantea** (Walt.) Muhl., it was pointed out that this event is of infrequent occurence according to the literature (Marsh 1970). My interest in this phenomenon was stimulated by the account of Fernald and Kinsey (1958, p. 91-2) on the use of the grains as food.

McClure (1966, chapters 2 and 6) has extensively discussed the problems presented by the irregularity in the flowering and fruiting of many of the bamboos. Clayton (1965) stated that although periodicity in bamboos may not differ in principle from that in annual plants, the long cycle involved discourages serious experimental work.

Two well-known botanists of Arkansas, Dr. Delzie Demaree and Dr. Dwight D. Moore have both told me that over the years the flowering of **Arundinaria** has rarely been observed. Dr. Demaree also told me that Dr. E. J. Palmer (deceased) had long sought the flowering plants in the field and considered the occurence to be quite rare.

Since 1967 I have continued to observe the flowering of cane in widely scattered locations in Arkansas. Attention has been especially directed to a site along the Caddo River north of Amity in Clark County. Heavy flowering was first observed in the Amity site on the south side of the river in the spring of 1969. Floriferous culms died during the summer following flowering.

In the spring of 1970 flowering was observed in the same site and on a later trip, flowering was found in a canebrake on the north side of the river. The presence of old dead culms indicated that flowering had probably occurred on the north side in 1969 also.

Profuse flowering was found again on both sides of the river in 1971. In contrast to the previous two springs, a considerable amount of fruit was observed to form and shed out on the ground. Insect attack was

very heavy, and no germination of the grain has been found in the field.

Transplant Experiments

On February 28, 1971, shoots and rhizomes were found bearing buds up to an inch and a half long. Several rhizomes were dug up and taken to the laboratory. After the shoots and roots were pruned, six rhizomes were planted in sandy soil in the greenhouse, two were placed in vessels of water, and two were planted in a flat which was placed in a Lab-Line Biotronette Mark III environmental chamber.

During the experimental time incoming daylight was the only light source in the greenhouse. Temperatures ranged from 40° to 100°F, and relative humidity ranged from about 15 to 100%.

The environmental chamber was set on an eleven hour light, thirteen hour dark schedule. The temperature was maintained between 80° and 85°F until March 5 and then gradually increased to 90°. Relative humidity fluctuated from 25% to 54% with approximately 40% as the most frequent value.

The Amity site was checked again on March 15 and on April 12. Canebrakes in other localities were also checked while on field trips during the period of the experiments. On April 4 several transplants were taken from the floodplain of Lost Creek west of Sheridan in Grant County. These were planted in the greenhouse.

Results

Of the ten transplants made February 28, eight developed inflorescences. Flowering was rapid, the first occurring in only nine days. Plump succulent grains developed in most spikelets in the greenhouse.

In the transplants taken from Grant County the buds have not yet expanded.

No flowering had taken place in the Amity site by March 15, but on April 12 profuse flowering was observed. Development in the field is at a much earlier stage than in the greenhouse. Flowering has not been observed at other sites thus far in 1971.

Details of the experimental results in the transplants taken from Amity follow.

Transplant 1, sandy soil in greenhouse. This was the first plant to flower, some flowers being open on March 9. Four flowering branches developed from the uppermost node remaining on the main culm. By March 16 a flowering shoot from the base of the plant approximately the height of the rest of the plant. This shoot developed to about twice this height by March 24. By April 13 disarticulation was well underway, and florets were lying on the ground. Grains measured from about 1 to 1.5 cm in length.

Transplant 2, sandy soil in greenhouse. Only a vegetative shoot developed.

Transplant 3, sandy soil in greenhouse. Flowers which were closed on March 10 were open on March 12. Additional flowering shoots had formed and reached a height of about 46 cm by March 16. Formation of fruit was evident by March 30.

Transplant 4, sandy soil in greenhouse. Flowers which were still closed on March 16 were open by March 24. Setting of fruit followed.

Transplant 5, sandy soil in greenhouse. Shoots had expanded up to 20 cm in length by March 16, but inflorescences were not evident. The flowers did not open until after March 24.

Transplant 6, sandy soil in greenhouse. Flowers were beginning to open on March 16. Flowering was very profuse by March 24, and grain formation was assured by March 30. Fully developed grains were obtained from spikelets on April 13.

Transplants 7 and 8, placed in vessels of water. Development was slower than in some of those growing in soil. One shoot bearing young spikelets had reached a height of 70 cm by March 24. Adventitious roots formed under water were chlorophyllose and bore root hairs along the entire length. Root development was less in the taller of the two plants. Flowers had opened by March 30, and the contrast in root development was still evident. Grain formation was sparse.

Transplants 9 and 10, placed in environmental chamber. One of the plants did not grow. In the other plant the bud of the highest node began elongation by March 8 when the temperature reached 90°. The shoot was 16.5 cm long on March 9, 31 cm long on March 11, 74 cm long and with an expanding inflorescence on March 15. The flat was transfered to the greenhouse on March 16 for photographing and left there. After the anthers exerted the florets dried without grain formation.

Discussion

The results of the experiments seem to preclude the significance of a photoperiod since plants in the environmental chamber and in the greenhouse flowered under different lighting schedules. Likewise drought, a frequently suggested cause of flowering, is ruled out as a factor at least during the period in which the flowering shoots elongate and develop, since even those with the roots growing in vessels of water produced flowering shoots.

Two factors which could be significant are the increase in temperature resulting from transplanting to indoors and the injury stimulus of pruning. Evidence that grazing or other injury may induce flowering cannot be ruled out, but it has not proved to be inevitably reliable. Flowering at the Amity site would not be solely a response to normal seasonal temperature increase unless annual flowering occurs, and flowering does not occur throughout this local population. Injury factors which may be involved include flooding and insect attack as well as grazing.

Of course carefully planned experiments with control

plants will be essential to a further investigation of flowering, and an experimental program including controlled temperature and injury as well as continued field investigations is projected from the present time through the following spring.

That some of the observed cane populations of Arkansas could represent unusual gene pools is a possibility which must be considered. Flowering occurs much more regularly in some species of **Arundinaria** than is known in our native **A. gigantea.** McClure (1966, p. 202) has expressed the potential importance of unusual clones of bamboos as follows:

> The economic success of large-scale exploitation will depend to an important extent on the cultivation of elite bamboos, selected for outstanding quality and high productivity. Such traits will be found associated only in an occasional individual clone.

Fernald and Kinsey (1958) have discussed the value of both the grain and the young shoots of **Arundinaria** for human consumption, and Gould (1958, p. 5) has pointed out its use as a valuable livestock forage. McClure (1966, p. 147 ff.) has emphasized the need of more comprehensive studies of the bamboos not only for purely scientific purposes but also to select and introduce bamboos for agriculture, domestic industries (such as pulp for paper-making) and conservation.

The finding either of a reliable way to induce flowering in the native **Arundinaria** or of an annually reproducing race would enhance the possible domestication of this species.

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A Survey of the Vascular Flora of Poinsett County, Arkansas

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ABSTRACT

A survey of the vascular flora of Poinsett County, Arkansas was made over a period of 13 months. The fifteen field trips taken were planned to include representative soil associations and geographic areas within the county. Three hundred sixty-three species and varieties from eighty-three families were collected or examined.

INTRODUCTION

Poinsett County is located in the northeastern portion of Arkansas within the region designated by Dale (1963) as "Mississippi Alluvial Plains and Terraces". It has an area of 760 square miles of which 81.2% (396,000 acres) (U.S. Dept. of Commerce, Bureau of the Census, 1967) is in farmland. This county is located in the northeastern part of Arkansas, and it is bordered by five other Arkansas counties: Mississippi County on the east; Craighead County on the north; Jackson County on the west; and Cross and Crittenden Counties on the south.

Poinsett County has a long growing season, with an average frost-free period of 231 days extending from March 18 to November 4. The average yearly rainfall is 49.94 inches and is usually well distributed throughout the year (U.S. Dept. of Commerce, Environmental Science Service Bureau, 1967-68).

The St. Francis River is a meandering alluvial waterway with a large floodplain (U.S. Dept. of Agriculture, Soil Conservation Service, 1963). It drains Poinsett County east of Crowleys Ridge. West of Crowleys Ridge, the relatively level land is drained by a series of ditches which empties into the L'Anguille River or the Bayou DeView. Several large reservoirs are present to control possible floodwaters.

The lowest point (200 feet) in Poinsett County occurs in the St. Francis flood plain (35°30' North, 90°30' West), while the highest point (440 feet) is located on Crowleys Ridge (35°29' North, 90°42' West).

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