Jamie L. Whitten Plant Materials Center

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VETIVER GRASS VARIETY TRIALS, 1989-1990

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ABSTRACT

There is a need for alternative, economical, and effective means of controlling erosion on sloping cropland using methods other than conventional engineering construction practices. One alternative involves the use of a narrow band of dense, stiffed-stemmed, perennial vegetation planted on the contour across the slope. According to work conducted by the World Bank, an ideal plant for use in vegetative contour hedgerows is vetiver grass [*Vetiveria zizanioides* (L.) Nash]. Because of its widespread use and success in other regions of the world, the Jamie L. Whitten Plant Materials Center (PMC) began the propagation of vetiver grass in 1989 in preparation for a widespread testing effort over the southeastern United States. Below zero temperatures, however, at the end of the vetivers' first growing season at Coffeeville, Mississippi resulted in total winterkill. Specific ecotypes of the vetiver species would be highly desirable for use as a contour hedgerow component, but its susceptibility to winterkill at temperatures below 7° F restricts its use in temperate areas of the southeastern United States.

INTRODUCTION

Adapted, erect, dense, stiff-stemmed perennial grasses are needed in the service area of the PMC (MLRA's 131, 133A, 134, 135) for use as vegetative hedgerows on sloping cropland. Narrow hedgerows of vegetation such as vetiver, when planted on the contour across sloping cropland, reduce the velocity of surface runoff and subsequent sediment movement and soil loss. The value of grass hedges was recognized by the Soil Conservation Service (SCS) in an earlier era, but the practice was laid aside as modern engineering practices came into widespread use. Although vegetative hedges are considerably less expensive to install and maintain than conventional earthen terraces, several years may be required for the vegetation to grow and establish itself as a functional, effective barrier to soil and water movement.

Vetiver conservation plantings have been extensively used in India, Asia, Africa, and the Caribbean for many years (National Reseach Council, 1993). Vetiver grows in very dense, compact clumps. Its leaves and stems are erect, stiff, tightly compressed, and overlapping, making vetiver a formidable physical barrier to down slope surface water movement (Smyle and Magrath, 1990). Runoff is slowed and greater time is allowed for

surface water to infiltrate and recharge soil moisture. Its dense, overlapping stems also aid in filtering soil sediments and debris from runoff (Greenfield, 1989). These materials are deposited against the upper side of the hedges and in time the accumulated deposition build up, forming a natural terrace. As the process of erosion and deposition continues, the uphill gradient gradually flattens.

The vetiver plant is anchored by long, fibrous roots which form a dense underground network. These roots, which grow straight down, pose little competition to the growth of adjacent crops.

Vetivers which produce viable seed potentially could escape and become an exotic pest, and therefore should not be used. Plant only the fragrant root type vetiver grasses of South India origin. This type does not produce rhizomes, stolons or viable seed. It is propagated vegetatively by dividing the plant into slips or planting pieces of one to several stems in number.

After being well established, vetiver can withstand extreme drought and long periods of inundation. It is tolerant of a wide range of soil pH, soil fertility, soil salinity and has the ability to uptake exchangeable aluminum and other toxic metals. In addition to its use in contour vegetative hedgerows, other potential conservation applications of vetiver include streambank and gully stabilization, filter strips, sediment basins, and constructed wetlands (The World Bank, 1990).

MATERIALS AND METHODS

In 1989, the PMC began an assembly of available vetiver accessions for increase, distribution, and testing by cooperating universities, state and federal agencies, and other PMC's. The assembly included one accession from Sunshine, Louisiana (9054943). This accession has fragrant roots and produces no viable seed. Four other accessions (viable seed producers) were received from the regional Plant Introduction (PI) Station in Griffin, Georgia. These accessions were: 271633, 302300, 196257, and 213903. A final accession (537061) was received in 1990 from the National PMC (NPMC), Beltsville, Maryland.

To meet the anticipated cooperative testing needs, an increase block, one-half acre in size, of the Sunshine accession was planted in mid-April, 1989. Planting stock was subdivided into slips of one to several stems in number. Plant spacing was 3 foot centers in-row and 80 inches between rows. Fertilizer (analysis 13-13-13) was applied at rate of 600 pounds per acre.

In addition to the increase planting, an evaluation trial comparing the Sunshine accession with four accessions from the Georgia PI Station (viable seed producers) were planted in side by side, non-replicated plots on June 1, 1989. This planting consisted of plant slips of the Sunshine accession, and both plant slips and seed of the four accessions obtained from Griffin, Georgia.

Another trial was planted May 10, 1990 comparing Sunshine and the NPMC accession for growth, vigor, basal density, seed production, and plant uniformity.

RESULTS AND DISCUSSION

The Sunshine accession was first received in late January, 1989. It was divided into plant slips and heeled in until planting in mid-April. A late frost on April 10, 1989, killed all of the top growth and the plants did not make recovery until mid-May. After a slow start, the planting slips rapidly increased and over 20,000 plants were produced by the end of the growing season. Seed producing accessions planted June 1, 1989, also grew rapidly and produced a heavy seed crop. The Sunshine accession did not produce seedheads.

Vetiver had once been cultivated in southern Louisiana and Texas, but little is known of its range of adaptation in the United States. Although vetiver is a tropical plant, literature indicates that in other areas of the world it has withstood a wide range of extremes, thriving in the parched, arid state of Rajasthan, India where temperatures can reach 130° F, and surviving in Fujian, China where winter temperatures can drop to lows of 16° F. (National Research Council, 1993). High expectations for its adaptation at Coffeeville proved to be premature. Unseasonably warm temperatures in early December, 1989 followed by an extended period of low Arctic temperatures tested the winter hardiness of many local plant species. Being a native of tropical and subtropical regions, vetiver does not appear adapted to temperatures below 7° F. The Sunshine accession had 100% loss due to winterkill. Only one plant of the seed producing accessions survived, but that plant was weak and slow in developing. Seed producing accessions did produce viable seed which germinated readily in both greenhouse trials and as volunteers in the field. Winter temperatures in 1990 and 1991 were not as severe as that of 1989. Later plantings of vetiver survived those years, although spring recovery and early development remained slow. In subsequent years (1992 and 1993), with temperature lows of 7° F, the volunteer vetiver seedlings had better survival than either the Beltsville or the Sunshine accession. Because of their greater tolerance for lower temperatures, and their ability to spread by seed, viable seed producing accessions have potential for becoming noxious weeds.

CONCLUSIONS

Although vetiver is not climatically adapted to most areas of Mississippi and the southeastern United States, there may be some instances where possible benefits may outweigh its potential for winterkill. Those parts of the PMC service area not frequently subjected to temperatures lower than 7° F, (i.e., extreme southern Mississippi, Alabama, and Louisiana) would be better suited for the use of vetiver in conservation measures. In any case, the viable seed producing types should not be used. Unless cold tolerant, fragrant root strains become available, vetiver will no longer be evaluated as a hedgerow plant at the PMC.

LITERATURE CITED

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