Experiences with the control of *Brachiaria arrecta* in a wet environment

A. Rajkumar[1] and S. Amichand[2]
1 Guyusuco Agriculture Research Centre, LBI, 2 Uitvlugt Estate , Guysuco

ABSTRACT

Brachiaria arrecta was introduced as a forage crop for the cattle industry in the late 1950's. It was largely successful since cut stems germinates readily at nodes and grows vigorously in a wet nutrient rich environment. It was distributed to cattle farmers who later extended it to other areas. It however, has a high weed potential rating in the sugar cane environment since its allelopathic properties displaces the sugar cane plant and it's growth leads to blockages of drainage canals and other water ways. An initial lack of knowledge of the biology of the vigorous growing *Brachiaria arrecta* resulted in its proliferation the wet Uitvlugt estate and frustrated management capacity to cope with its spread. Numerous strategies such as burning, herbicide treatment before ploughing, long term fallow after ploughing, regulated planting dates, mechanical and physical removal were practised with favourable success. *Brachiaria arrecta* is relatively tolerant to treatment with the herbicides glyphosate-isopropylamine salt and asulam-sodium. However, Imazapyr-isopropylamine salt and glyphosate herbicides combination has been found to effect an extended period of suppression of the weed. Cropping of these treated areas with sugar cane has not shown any adverse effect on plant development and yield.

INTRODUCTION

Brachiaria arrecta was introduced into Guyana as a fodder grass and is adapted to a wet environment. In the nutrient rich environment in the sugar estate it can grow aggressively displacing other species through allelopathic properties eventually displacing the stand of canes completely after one or two crops. The grass readily produces roots and branches at the nodes with runners growing to lengths of over five meters.

Brachiaria arrecta thrives aggressively at the Uitvlugt sugar estate located on the West Coast of Demerara and situated in a high rainfall zone where annual rainfall averages over 2600 mm and where in some years in excess of 3000 mm is experienced. The estate drainage efficiency was reduced over the years through sedimentation, weeds growth and loss of access leading to longer retention of water in the cultivation and to constant soil wetness. In such a nutrient rich environment the grass was able to realise its growth potential.

Tanner grass was planted at Uitvlugt estate in 1985 primarily as a fodder for oxen and dairy animals. It became a significant weed in 2005 after floods on the estate distributed a high propagules density over a larger area. Under wet conditions in the nutrient rich cane fields the grass was able to utilize these resources and in a relatively short time period, became a weed of economic significance. *Brachiaria arrecta* was observed to grow at

about 30 cm per week with multiple branching occurring readily from nodes, which in turn produced several other branches. In mature canes the grass uses the cane stalk for support and grows upwards for light which further enhanced its ability to out-compete the cane plant. Observations done in fields six weeks post planting showed that emerged plants grew to lengths of about 2 meters. In a relatively short time frame the grass with the dense sward produced was able to displace and out-compete the cane plant. Cane setts growing close to where nodal rooting occurs do not develop and those within the grass patch actually die.The resultant effect was that fields were taken out of production; yields in others were significantly reduced and cost of production significantly increased.

DESCRIPTION

The synonyms of the grass are *Brachiaria radicans* and *B. latifolia*. Its natural habitat is swampy and seasonally flooded grasslands. The grass was introduced into the Americas. It is a stoloniferous perennial grass and grows to 100 to 150 cm with glabrous, geniculate culms, rooting at the lower nodes, and lanceolate leaf-blades up to 15 cm long by 12 mm wide. The dry and green matter yield three months after planting was 12,880 kg/ha. The grass rarely produces an inflorescence and the seeds are not viable.

MANAGEMENT APPROACHES

Treatment with the herbicides glyphosate sodium and asulam sodium often resulted in limited suppression of the grass and usually required repeated applications to effect control. The wide spectrum herbicide Imazapyr has been demonstrated to effectively kill the weed but because of its prolonged residual effect on general vegetation its use has generally been restricted to non crop areas.

Manual weeding generally resulted in fragmentation of the grass and dispersal of propagules. The use of a tractor mounted rake in heavily infested fields was also employed to remove the grass from fields. Another control strategy involved burning to reduce the weed's biomass and to permit ploughing of the soil but this was restricted to the drier parts of the year and was done mainly on dams and in abandoned fields where there were large amounts of dry biomass. Ploughing infested areas resulted in stems and root stocks being distributed in the plough layer from where an even higher infestation occurred.

In flood fallowed fields, that is, where the land was mechanically prepared and flooded for a minimum of six months the grass was effectively killed and there was no regrowth. Re-infestation however, usually occurred from periphery of fields and from the drainage system where propagules entered the field. In fields flooded for shorter duration of three months or less the grass is not killed and germination occurred readily from buried stems after canes were planted.

The experiences with the use of cultural, mechanical and chemical methods of control coupled with the accumulation of knowledge of the weed have led to the adoption of improved management strategies for controlling this weed in the cane cultivation. In the

wet sugar cane environment the control of *Brachiaria* arrecta would result in improved cane yields, reduce herbicide input and reduce overall expenditure.

During 2007, all fields at UItvlugt received pre/early post emergent application of herbicides. In fields where tanner grass was present, there was no effect of the herbicides on its growth and development. The pre/early post emergent herbicides used were either isoxaflutole with diuron or s-metoalachlor with terbutryn. There were ineffective to prevent bud eye germination of tanner grass from nodal fragments.. Post application herbicide treatments were necessary Applications of post emergent herbicides namely asulam-sodium and glyphosate-isopropylamine at standard Industry rates did not result in complete control and the few dormant buds that survived germinated and reinfested treated areas. The herbicide terbutryn when applied resulted in defoliation of the plant and was ineffective as an intervention. The introduction of a tank mix of 50% imazapyr-isopropylamine with 50% glyphosate isopropylamine to non crop areas and also within field with thick swards of the grass resulted in effective control. This tank mix was also introduced as a pre tillage broadcast treatment in heavily infested fields. Canes planted in these areas after eradication did not show any adverse effect in term of cane development and yields. The dense sward of the grass during treatment intercepted the spray mixture and probably prevented a high deposit of the residual chemical imazapyr on the soil.

APPROACHES TO TANNER MANAGEMENT

1. WEEDING

Weeding as a form of control whilst effective against other grasses was not successful in the control of tanner grass since it fragmented the plant into smaller potential propagules. With the ability to displace the cane plant, the grass infestation level increased several folds in most areas weeded especially when done in the wetter part of the year. This approach is restricted to the plant canes and early ratoon crop since it is heavily labour reliant.

2. ROUGING

This is the physical removal of the plant from fields. The grass was dug out, bagged and transported out of fields. In plant canes where regrowth was from buried stems, a small modified hand held fork was used to dig out the grass. When the cutlass was used for this purpose invariably, stems were cut below the ground which allowed for regrowth. This activity like weeding was limited and was effective more in the plant canes where the soil was loose and allowed for ease of removal of plants.

3. MECHANICAL RAKING

Spring tines mounted at the rear of a tractor was used to rake the grass from fields. It either cut or uprooted the grass and effectively removed the above ground biomass from the field. This activity was time consuming as the tractor had to drag the mass and heap it out of the field which entail long

travelling distances. This added to the cost of the operation. However, the very viable root stock were not removed and contributed to re-infestation.

4. BURNING

This was effective in reducing the biomass of the grass where the grass had formed a thick mat. Slashing of dams and thereafter burning the dry matting was also done. This activity was restricted to the dry period of the year. Regrowth from the root stock is invigorated after burning and there are two possible outcomes. The weed if left untreated repopulated the burnt area or was if chemically treated early when the plant was actively regenerating itself was effective in containing it.

5. BURIAL

The weed under damp and wet conditions grows lusciously along canal edges spreading over the water surface with a thick mat of root forming below trapping soil and other plant debris. Burial in a ditch was not very successful in containment since fragments of the weed became mixed with the excavated soil which when exposed allowed the plant to repopulate the area. The clay soil placed over is usually of a high swelling nature and when drained, shrinks and forms numerous cracks exposing the underlying buried stems or allowing germinating plants to easily reach the surface. The excavated soil is also rich in nutrients and the grass to grow aggressively.

6. MECHANICAL TILLAGE / PARTIAL REHABILITATION

During land preparation, burnt stubbles or whole stems became fragmented and were incorporated within the plough layer effectively dispersing the weed. Stubbles on the soil surface exposed to sunlight became desiccated whilst those within the plough layer remained viable. Stem buds were damaged and unable to germinate however, the remaining viable stem buds and root stubbles quickly repopulated the area.

7. FLOOD FALLOWING

This is the practise where clay based soils are tilled and inundated for a period of six months at a depth of 30 cm water at the highest point. All plant material incorporated within rots. If the period of flood is shorter the level of control achieved is reduced. The plant is able to survive inundation for two months and bud eyes germinate after the soil is drained.

8. PLANT COMPETITION

Planting early canopying varieties and regulating the planting density was not effective since the weed is able to outgrow the plant, form a dense sward and has allelopathic properties. Cane plants germinating near to or between the grass usually succumbs whilst mature cane is able to survive a longer period and is displaced in either one or two growing season. The planting density used was increased by reducing the row spacing from 152 cm to 122 and 90 cm. A row consists of two parallel sets of canes planted 30 cm apart. This was

increased to 60 and 90 cm but was ineffective to out-compete the growth rate of *Brachiaria arrecta*.

9. CONVENTIONAL HERBICIDE TREATMENT

As a matter of policy, all fields except those flood fallowed receive pre/early post emergent herbicide application. The herbicides used are either a combination of isoxaflutole and diuron or terbutryn and metolachlor and applied within two to three weeks after planting or harvesting to control emerging weeds. The pre to early post emergent herbicides were not effective in controlling stem germinating weeds.

Treatment of the weed with asulam sodium or glyphosate isopropylamine was not effective at the late post emergent stage. Stems formed callus which stopped the herbicide and only allowed part of the stem to die. Bud scales from the root stubbles germinated and eventually formed healthy plants. At intervals where nodal rooting occurred some of the bud eyes were able to survive.

10. IMAZPYR APPROACH

The use of imazapyr isopropylamine in combination with glyphosate isopropylamine resulted in an effective kill of the weed. It was used in weed susceptible areas in primarily non-cane areas within fields or on dams and parapets. In areas without canes the herbicide combination was first used to eradicate the weed, followed by land preparation and replanting of these areas. There has been no subsequent adverse effect on cane establishment and yields. This combination offers a window of opportunity where effective control is not achieved with the other methods.

CONCLUSIONS

The introduction of the pasture grass, *Brachiaria arrecta* in a wet nutrient rich environment led to its success and its eventual introduction in the sugar cane environment led to significant yield decline and demanded additional resources for containment. The initial lack of knowledge to manage an aggressive and invasive weed species led to its spread. An integrated approach as used by Uitvlugt estate has led to its containment. However, with the ability of the grass to grow readily from fragments and with its rapid growth rate, the adopted management strategy must be to ensure that cognizance is taken of all the approaches and to prevent the weed to again become a significant threat.

An improvement in the drainage system resulted in reduction of areas favourable for growth. With rainfall averaging 2600 mm or greater, it was imperative to remove water quickly from the cultivation. During the wet season when conditions are ideal for growth the drainage influence would be less effective but would impact significantly during the drier period. The allelopathic properties of *Brachiaria arrecta* to sugar cane, its competitive growth rate is reduced and would effectively contribute to conditions more suitable for cane growth.

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