

Use of Goats as Biological Agents for the Control of Unwanted Vegetation

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ABSTRACT

Much of hill land pasture in the Appalachian region of the United States is weed and brush infested. In addition, over 500,000 ha of forest in the Southeastern region of the country is invaded by kudzu (*Pueraria lobata*). Current weed management and control practices rely heavily on herbicides. Low cost, low input and environmentally acceptable reclamation procedures are needed to maintain these pastures and forest land in production. A field study was initiated at the North Carolina Department of Agriculture Mountain Research Station in Western North Carolina to evaluate the effectiveness of utilizing goats alone (30 mature brush does/ha) or in combination with cattle (17 mature brush does/ha + 2 to 3 steers/ha - 225 kg live weight) to renovate overgrown mountain pastures and to control multiflora rose (*Rosa multiflora Thunb.*) bushes. Over four grazing seasons, managed defoliation with goats alone or goats with cattle resulted in a substantial increase in vegetative cover (goats: 65 to 86%; goats + cattle: 65 to 80%) by favorable grass and legume species (goats: 16 to 63%; goats + cattle: 13 to 54%) while vegetative cover decreased from 70 to 22% in the control plot. Multiflora rose bushes were practically eliminated over the 4-year period in both the goat (100%) or goat + cattle (92%) treatments. In another field study conducted at the North Carolina State University research farm in Raleigh, growing buck kids (initial live weight: 17.3 kg) were stocked at the rate of 18 or 29 animals per hectare and rotationally grazed on 12 kudzu plots for 49 and 31 days, respectively. Daily gain and gain/ha for the grazing period averaged 60 and 88 g/day and 54.4 and 78.8 kg/ha, respectively. These results indicate that goats may be a viable management tool for the control of unwanted vegetation.

RESUMEN

Uso de cabras como agentes biológicos para el control de vegetación indeseable. Gran parte de las pasturas de ladera en la región de las montañas Apalaches en Estados Unidos está infestada por malezas y arbustos. Adicionalmente, más de 500,000 ha de tierras forestales en la región sudeste del país están invadidas por kudzú (*Pueraria lobata*). Las labores de control y manejo de malezas actualmente usadas se basan principalmente en el uso de herbicidas. Prácticas de recuperación de bajo costo, bajo insumos y ecológicamente aceptables son necesarias para mantener esas pasturas en producción. Un estudio fue

iniciado en la Estación Experimental de las Montañas del Departamento de Agricultura de Carolina del Norte para evaluar la efectividad de utilizar cabras solas (30 cabras mestizas/ha) o en combinación con ganado vacuno (17 cabras/ha + 2 o 3 novillos/ha - 225 kg de peso vivo) en la renovación de pasturas sobrecrecidas y en el control de arbustos de rosa (*Rosa multiflora Thunb.*). En cuatro años de pastoreo, la defoliación manejada con cabras solas o en combinación con novillos resultó en un incremento sustancial en la cobertura vegetativa (cabras solas: 65 a 86%; cabras + novillos: 65 a 80%) con especies de gramíneas y leguminosas favorables (cabras solas: 16 a 63%; cabras + novillos: 13 a 63%) mientras que la cobertura vegetativa en el control disminuyó de 70 a 22%. Los arbustos de rosa fueron prácticamente eliminados después de un período de 4 años en los tratamientos con cabras solas (100%) y cabras combinadas con novillos (92%). En otro estudio conducido en la finca experimental de la Universidad Estatal de Carolina del Norte en Raleigh, caprinos machos jóvenes (peso inicial: 17.3 kg) pastorearon 12 parcelas de kudzú por 49 y 31 días a una carga equivalente a 19 y 29 animales/ha respectivamente. La ganancia diaria de peso vivo y la ganancia de peso/ha en el período de pastoreo promedió entre 60 a 88 g/día y 54.4 a 78.8 kg/ha para las cargas de 19 y 29 animales/ha respectivamente. Estos resultados indican que las cabras pueden ser una herramienta viable de manejo para el control de vegetación indeseable.

INTRODUCTION

In the Southeastern United States, goats are becoming increasingly important contributors to the income of many producers. In addition, the role of goats as biological control agents is becoming ever more important due to environmental concerns and elevated costs of other control methods such as mechanical cutting and herbicide application (Magadlela et al., 1995). There is also a need to evaluate forages and forage systems for goats that are integrated with existing cattle operations. It is estimated that most beef cattle farmers would have enough "excess" feed in cattle pastures to feed 1-2 goats per cow with no additional feed input. The complementary effects of grazing cattle and goats on the same farm provide an opportunity to enhance and augment the existing beef cattle industry by improving pasture condition and feed quality. The purpose of this paper is to describe research results with potential for the development of practical feeding systems for meat goats.

GRAZING STUDIES

Biological Control of Weeds and Brush. Much of hill-land pasture in Western North Carolina is brush infested. Low cost and low input reclamation procedures are needed to provide owners with ways to maintain these pastures in production. In a demonstration conducted at the NC Department of Agriculture Research Station located in Waynesville at approximately 35.50 N lat. and 83.00 W long., brush goats were grazed alone (30 mature does/ha) or with cattle (17 mature does/ha with 2 to 3, 225 kg steer/ha for 4 years in a 2.4 ha apple orchard left untouched for 15 years. The orchard was divided into five sections consisting in a control paddock, two replicated paddocks grazed by goats alone and two replicated paddocks grazed by goats + cattle. Grazing occurred for 45 to 60 days from May to July and for another 24 to 35 days in September and October. The grazing/browsing periods were determined by

available forage. The botanical composition of the grazing site was primarily herbaceous weeds such as brambles (*Rubus spp.*), honeysuckle (*Lonicera japonica*), chickweed (*Stellaria spp. L.*), thistle (*Cirsium spp.*), multiflora rose (*Rosa multiflora Thunb.*) and hardwood saplings with some grass and clover. Over the four grazing seasons, the vegetative cover increased from 65% in May 1991 to 86% in October 1994 in the goat pasture, and from 65 to 80% in the goat + cattle pasture (Table 1). In addition, the cover from favorable grasses and legumes increased from 16 to 63% and from 13 to 54% in the goat and goat + cattle pastures, respectively. Vegetative cover in the control plot declined from 70% in May 1991 to 22% in October 1994, with the cover from grasses and legumes ranging from 10 to 27%. The shift in botanical composition in the grazed plots was attributed to the preference of goats and to a lesser extent of cattle for the broadleaf species, which allowed favorable grasses and legumes to be more competitive. Goats and goats + cattle were also very effective in controlling multiflora roses. Individual multiflora rose bushes were identified and marked to determine the effects of browsing on plant survival. Multiflora rose bushes were practically controlled after four grazing seasons, as shown by their reduced height and the number of dead canes (Table 2). However, large quantities of new shoots have sprouted on the pasture following two years of rest, indicating that some roots were still viable and that multiflora roses bushes are difficult to eliminate permanently. Another experiment was subsequently started in spring 1996. The experimental area of the orchard was expanded and divided into nine sections consisting of three control paddocks, three replicated paddocks grazed by goats + cattle (6 growing Angus steers and 9 adult Boer and crossbred Boer bucks) and three replicated paddocks grazed by cattle alone (6 growing Angus steers). Animals were rotationally grazed among the paddocks from April to October. Animal performance and the survival of black locust (*Robinia pseudoacacia*), an indigenous leguminous tree invading the experimental plots, are being monitored in addition to the measurements taken during the previous experiment.

Biological Control of Kudzu. Kudzu (*Pueraria lobata*) is one of the most aggressive legume vine growing in the Southeastern United States (Bonsi et al., 1991). Herbicides have been used to control kudzu, but these chemicals are expensive and repeated applications are usually required. In addition, environmental concerns associated with the repeated use of chemicals cannot be over emphasized. A preliminary experiment conducted at the North Carolina State University research farm located in Raleigh, at approximately 35.75 N lat. and 78.75 W long., was designed to examine whether or not brush goats might thrive while controlling this unwanted plant. In July and August 1993, 16 growing bucks and wethers of a non-descript breed (initial live weight: 22 kg) were continuously grazed on kudzu for 49 and 26 days at a rate of either 59 or 99 head/ha, respectively. Animals on the low stocking rate gained 25 g/d compared to a loss of 26 g/day for animals stocked at 99 head/ha. The following year, 12 growing bucks of a non-descript breed (initial live weight: 17.3 kg) were rotationally grazed on 12 kudzu plots for 49 and 31 days at a rate of either 18.5 or 28.9 animals/ha (Table 3). Animals on the high stocking rate were grazed for a shorter period because of lack of adequate regrowth. The experimental design was a randomized complete block with 2 replications. Shrunken live weights were determined at the start and completion of the experiment by withdrawing feed and water overnight from the animals. Animals gained 60 and 88 g/day, respectively, resulting in 52.9 and 78.3 kg gain/ha for the length of the grazing period. These results indicate that goats might offer a viable alternative to achieve management and control of this unwanted plant while providing additional income to goat farmers.

CONCLUSIONS

The foraging habits of goats have important environmental implications by ultimately increasing the sustainability of integrated production systems and at the same time providing an additional source of income to producers. However, the above findings warrant further investigation.

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Table 1. Effect of grazing on total soil vegetative cover and percent vegetation as grass over four grazing seasons

Item, %	May 1991			October 1994		
	Control	Goats	Goats/Cattle	Control	Goats	Goats/Cattle
Vegetative cover	70	65	65	22	86	80
Cover as grass	10	16	13	27	63	54

Table 2. Effect of grazing goats and goats/cattle on survival of multiflora rose bushes over four grazing seasons

Item, %	May 1991			October 1994		
	Control	Goats	Goats/Cattle	Control	Goats	Goats/Cattle
Characteristic of multiflora rose bush						
Height, m	2.7	2.1	2.1	2.0	.4	.7

Dead canes, %	0	0	0	0	100	92
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Table 3. Performance of buck kids grazing kudzu - 1994

Item	Treatment 1	Treatment 2
Duration, d	49	31
Stocking rate , head/ha	18.5	28.9
Intitial wt, kg	17.3	17.2
Final wt, kg	20.3	20.0
Daily gain, g	60	88
Gain/ha, kg	54.4	78.8

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