PRODUCTION, NUTRITIVE QUALITY, AND ROOTSTOCK SURVIVAL OF JAPANESE HONEYSUCKLE

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ABSTRACT

A study of Japanese honeysuckle was conducted from April 1970 through April 1972 on Barksdale Air Force Base in northwest Louisisana. Production and nutritive quality of honeysuckle under natural, fertilized, and/or control-burned conditions were evaluated.

Honeysuckle produced 948 ovendry pounds of forage per acre on a bottomland soil and 697 ovendry pounds of forage per acre on upland soils. It had a high regrowth response by seasons.

The survival rate of planted rootstock in a wildlife opening and under a forest canopy averaged 70 percent under different planting conditions.

Leaves contained a high nutrient quality throughout the year. They are available during the winter season when other browse reaches its yearly low in Louisiana. Field observations showed that deer browse honeysuckle the most during the winter season. Protein, phosphorous, and ash were consistently higher throughout the year on the bottomland soil. During the study the highest per acre production occurred in the spring and lowest in the fall and winter. The percentage of canopy cover affected forage production. Highest forage production came from exclosures with 0 to 35 percent canopy cover and lowest production from 65+ percent canopy coverage.

Japanese honeysuckle (*Lonicera japonica*) is one of the more important plants in the diets of white-tailed deer (*Odocoileus virginianus*) in Louisiana. This is because it's evergreen, abundant, and palatable. Cushwa *et al.* (1970) found honeysuckle to be one of the most highly preferred and widely consumed winter deer foods throughout the southeast. Rabbits (*Sylvilagus spp.*), bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*), and many other species relish the seeds and leaves of honeysuckle (Smith 1972, Rosene 1969, Hewitt 1967).

Japanese honeysuckle is native to eastern Asia and is well established in central, eastern, and southeastern United States (Gleason and Cronquist 1963).

This paper is a report on field trails of the production and nutritive quality of Japanese honeysuckle under natural conditions; the production and nutritive quality of honeysuckle under fertilized and control-burned conditions. It also gives the survival rate of rootstock planted in a wildlife opening and rootstock planted in the woods.

Such information is needed by SCS conservationists in helping landusers develop conservation plans.

STUDY AREA

The study was conducted on East Reservation, Barksdale Air Force Base in Bossier Parish, Louisiana. East Reservation is managed for multiple use of its natural resources. Emphasis is placed on forest, wildlife, and fishpond management.

Two primary habitat types exist on the area: (1) bottomland hardwoods along the stream floodplains, (2) mixed pine and hardwoods on the upland areas. Some of the most prevalent plant species associated with the bottomland hardwoods are nuttal oak (*Quercus nuttalli*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), hackberry (*Celtis laevigata*), overcup oak (*Quercus* lyrata), and greenbrier (*Smilax spp.*), Japanese honeysuckle, trumpet creeper (*Campsis radicans*), and rattan vine (*Berchemia scandens*) in the understory.

Upland areas are dominated by southern red oak (*Quercus falcata*), white oak (*Quercus alba*), black oak (*Quercus velutina*), hickory (*Carya texana*), post oak (*Quercus stellata*), loblolly pine (*Pinus taeda*), shortleaf pine (*Pinus echinata*) and understory plants such as honeysuckle, greenbrier, american beautybush (*Callicarpa americana*), and rattan vine.

Many different soil series occur on the area. Study plots in the bottomland were located on a Moreland soil. Moreland consists of somewhat poorly drained, very slowly permeable, alkaline clay soil. This soil developed from clayey sediments deposited by the Red River. It occurs at low local elevations. Moreland soil is high in natural fertility and has a moderate available water capacity.

Study plots in the upland habitat type were on Bowie and Susquehanna soils. These are well drained to somewhat poorly drained acid sandy loam uplands. Both are low in natural fertility and organic matter. Susquehanna soil developed from clayey marine sediments. Bowie soil developed from sandy loam and sandy clay loam sediments of the coastal plains.

METHODS

Exclosures

An area in the bottomland habitat type and upland habitat type was selected where established, dense stands of honeysuckle existed. Base lines were established by using a compass. Exclosures were randomly placed on the compass line.

Five exclosures in each habitat type or a total of ten were used for sampling. Exclosures were constructed using 8-gauge net wire and creosote pine posts. Each exclosure was 12 feet in diameter and 8 feet high.

Three 2-feet diameter plots were permanently established on the base line. Locations of the three plots were randomly picked from a hat out of a possible total of six. A short ½-inch diameter metal pipe was driven into the center of each sample plot for permanent identification.

Two of the three sample plots in each exclosure were sampled every 3 months. From April 1970 to April 1972, honeysuckle leaves were collected near the middle of April, July, October, and January. These dates are the approximate midpoints of the four seasons. The third plot was set up as a control plot and was sampled at the end of the first year. Sampling of each plot involved handpicking only the leaves in the 2-foot diameter circle from ground level to 5 feet above the ground. All the leaves were picked in each plot every sampling period. Leaves were picked from the same 2-foot diameter plots during the entire length of the study.

Samples were placed in plastic bags and weighed with a Feige Federwaage scale. The Feeds and Fertilizer Laboratory, Louisiana Agricultural Experiment Station, Baton Rouge, made the chemical analyses. Honeysuckle leaves were analyzed for percent of protein, fat, fiber, ash, calcium, and phosphorous.

First year of the study was used to determine the production per acre and nutritive qualities of honeysuckle under natural conditions. The second year, management techniques were applied to compare the differences in production and nutritive analyses. Following are the different treatments used:

Upland Exclosures (April 1971)

#1 — Control burned
#2 — Fertilized (72 lbs. of N.P.K./Acre)
#3 — Control burned
#4 — Fertilized (72 lbs. of N.P.K./Acre)
#5 — Control burned and fertilized (72 lbs. of N.P.K./Acre)

Bottomland Exclosures

#1 — Fertilized (72 lbs. of N.P.K./Acre)
#3 — Fertilized (72 lbs. of N.P.K./Acre)

None of the bottomland exclosures were control burned because research (Toole 1965) has shown the undesirable effects of burning in bottomland hardwoods. A second consideration was the proximity to base headquarters.

ROOTSTOCK PLANTINGS

A 1-acre wildlife opening in the woodlands was used in the honeysuckle planting study. Two-thirds of the opening was disked and the remaining one-third was left undisturbed. Two rows of the rootstock was planted with a shovel. Rootstock on the next two rows was placed on top of the soil and disked under. Rootstock was placed 6 feet apart in rows spaced 8 to 10 feet apart. Planting date was April 1971. Rootstock were obtained from nearby established stands.

Another strip size was put in the woods to determine the effects of canopy on rootstock survival. It was 100 yards long and 10 feet wide. The same spacings and procedure was used to plant the strip through the woods.

CANOPY COVER

Canopy cover over each exclosure and planting sites was estimated. Canopy cover percentages ranged from 0 to 90 percent on the upland plots and 0 to 100 percent on the bottomland plots. The canopy on the 1-acre opening was 0, and on the woodland strip was 80 percent.

RESULTS

First Year

Total production for the year was 697 ovendry pounds of forage per acre for upland exclosures and 948 ovendry pounds of forage per acre for bottomland exclosures (Table 1). This production was obtained under normal or near normal forest conditions. All figures are for the leaves only. Ovendry weights averaged 20 percent of the fresh weight in the spring, when honeysuckle growth was most rapid. Blair and Epps (1969) found leaves of seven species were more succulent in the spring. Also, their study showed moisture content of all plant parts declined and tissues became more fibrous the remainder of the year.

Green weights of honeysuckle varied during the study period by seasons from 139 pounds per acre to 3,051 pounds per acre. Lowest production came from the bottomland exclosures in the fall (October 1970) and the highest from the bottomland exclosures in the spring (April 1970). To have a uniform basis for comparison, ovendry weights were used.

Figures 1 through 6 give the seasonal contents of protein, fat, fiber, ash, calcium, and phosphorous for honeysuckle leaves. Exact amounts of all the elements necessary for optimum growth of deer is not known. However, studies (Magruder *et al.* 1957, French *et al.* 1955) have determined the requirements of

protein, phosphorous, and calcium for optimum growth of deer. Dietary requirements in the following discussion were taken from their work.

Honeysuckle sampled in this study contained the 13+ percent requirement for protein during the spring and winter seasons required for optimum growth of deer. In the summer and fall seasons, honeysuckle was below the optimum percentage but it did contain an excess of the 7 percent needed for maintenance. High protein and phosphorus content during winter may explain the heavy browsing by deer during this season. The Seqelquist *et al.* (1971) study of honeysuckle in Arkansas found *in vitro* digestion of honeysuckle leaves was significantly higher during the winter season. All these factors verify and help explain observations that the highest use by deer is during the winter season.

Calcium is important in the bone and antler development of deer. Deer make optimum growth when the daily intake of calcium is about .64 percent of the ingested dry matter. Honeysuckle leaves contained an excess of this amount during all seasons the first year.

Phosphorus requirements for deer appear to be about .56 percent of the dry matter intake. Honeysuckle in the bottomland samples contained this percentage only during the winter season.

Bottomland samples were consistently higher in percentages of protein, ash, calcium, and phosphorus. Percentages of fat and fiber were not consistently higher in either the bottomland or upland habitat types.

Control plots were not sampled at 3-month intervals but were sampled at the end of 1 year. Only minor variations occurred in nutritive analyses. Production was comparable to the April 1970 figures (Table 1).

Table 1. Per Acre Yield by Season from Upland and Bottomland Exclosures. No Treatment.

Date	Upland exclosures	Bottomland exclosures
	Ovendry weight	Ovendry weight
April 1970	342 lbs.	640 lbs.
July 1970	224 lbs.	160 lbs.
October 1970	74 lbs.	40 lbs.
January 1971	57 lbs.	108 lbs.
TOTAL	697 lbs./year	948 lbs./year

Second Year

Total production for the year following control burning and/or fertilization was 633 ovendry pounds of forage per acre for the bottomland exclosures and 314 ovendry pounds of forage per acre for the upland exclosures (Table 2). Yields of honeysuckle differed by seasons from 48 ovendry pounds of forage per acre to 235 ovendry pounds per acre. Lowest production came from the upland exclosures in the winter (January 1972) and the highest from the bottomland exclosures in the spring (April 1972).

Production from fertilized and/or control-burned exclosures was considerably lower than production from exclosures that had no treatment. It should be emphasized that the same exclosures were fertilized and/or control burned that were sampled the first year of the study. The consistent removal of all the leaves each season from the same plots may have been the reason for the lower production figures. Also after 1 year, honeysuckle vines had completely covered the majority of the net wire around the exclosures and reduced the sunlight penetration to the inside of the exclosures. If new exclo-

sures had been used, a better comparison between natural production, fertilized, and/or control burned possibly could have been obtained.

Normal rainfall for Shreveport, Louisiana (5 miles from the study area), was 46.2 inches for this 1year period. Total rainfall for the period April 1971 to March 1972 was 38.3 inches, or 7.9 inches below normal (Table 3). Nevertheless, honeysuckle regrowth was phenomenal.

Table 2. Per Acre Yield by Season from Upland and Bottomland Exclosures That Were Control Burned and/or Fertilized.

Date	Upland exclosures	Bottomland exclosures
	Ovendry weight	Ovendry weight
July 1971	116 lbs.	194 lbs.
October 1971	92 lbs.	104 lbs.
January 1972	48 lbs.	100 lbs.
April 1972	58 lbs.	235 lbs.
TOTAL	314 lbs./year	633 lbs./year

Table 3. Precipitation and Departure from Normal (April 1970 through March 1972)[1]

April (70)	5.12	+ .55	April (71)	1.06	-3.51
May (70)	4.36	- .43	May (71)	5.26	+ .47
June (70)	1.14	-2.20	June (71)	.97	-2.37
July (70)	3.94	+ .19	July (71)	6.15	+2.40
August (70)	2.04	- .51	August (71)	2.99	+ .44
September (70)	1.64	- .64	September (71)	1.30	- .98
October (70)	7.44	+4.63	October (71)	3.86	+1.05
November (70)	2.09	-2.12	November (71)	3.75	- .46
December (70)	3.80	-1.14	December (71)	3.65	-1.29
January (71)	.27	-4.53	January (72)	5.97	+1.17
February (71)	4.13	+ .04	February (72)	.94	-3.15
March (71)	2.11	-2.04	March (72)	2.45	-1.70
TOTAL	38.08	-8.20	TOTAL	38.35	-7.93

[1]From records at Shreveport, approximately 5 miles from study area.

Survival of Planted Stock

Survival ranged from 60- to 80-percent. The lowest rate of survival (60 percent) was the rootstock set out by hand in the open with no disking prior to planting. Highest rate of survival (80 percent) occurred in the woodland where the soil was disked prior to planting. No difference in survival (75 percent) existed in the rootstock that was hand planted or disked under where the soil had been disked prior to planting. Selqelquist *et al.* (*ibid.*) reported a 92- to 97-percent survival of honeysuckle in wildlife food plots in the Arkansas Ozarks. Rainfall was 6 inches above normal during the first growing season.

In this study, rainfall for the month of April was 3.5 inches below normal. For the 3-month growing period of April, May, and June, rainfall was 5.4 inches below normal. This may account for the lower survival rate among honeysuckle rootstock.

Canopy Cover

The percentage of canopy cover affected forage production. Highest production resulted from exclosures with a 0- to 35-percent canopy cover. Lowest production occurred on an upland exclosure that had 90 percent canopy cover. From the total ten exclosures, the forage yield was consistently lower on the ones that had 60 percent or more canopy cover. This supports the findings of Halls and Alcaniz (1968) that twig growth of 21 browse species averaged nearly 7 times more on plants in the open than those beneath trees.

DISCUSSION

A review of the literature showed that the quality and quantity of browse produced by honeysuckle is higher than most browse plants in Louisiana. Leaves of honeysuckle are especially valuable because of their high protein content throughout the year and their availability during the winter season when most other available browse reaches its yearly low.

Bottomland soil was the most productive. Average production for the 2-year study was 790 pounds of ovendry forage per acre. Average production for the upland soils was 505 pounds of ovendry forage per acre.

Production following fertilization and/or control burning was lower than under natural conditions. Rainfall for both years of the study was 8 inches below normal. The same plots that had been clipped the previous year were fertilized and burned. Probably this accounts for the lower production figures.

Survival of all planted rootstock averaged 70 percent. Rainfall for the 3-month period following planting was 5.4 inches below normal. Disking prior to planting increased the survival rate of rootstock.

Kimble (personal communication) has had success in planting honeysuckle in wildlife openings and placing brush piles over the plants to protect them from browsing until they are firmly established. This procedure also gives the vines something to grow on and keeps the browse within easy reach of deer if the brush piles are kept low and fairly small.

Some land managers presently think of honeysuckle as a pest to be controlled in forests. At Barksdale, honeysuckle does not control the site. Timber, bottomland and upland, is dominant over honeysuckle.

Deer-range carrying capacity can be increased with the establishment of honeysuckle. The increase in carrying capacity can be accomplished without sacrificing any timber production. Studies have been shown that it takes approximately 2.5 pounds of dry forage per day for a 100-pound deer (Smith 1950, Davenport 1939). An average acre of established honeysuckle produces 500+ ovendry pounds per year. If only half of this is utilized, it is easy to see the management potential and implications that honeysuckle possesses.

Honeysuckle is highly sought after by deer in the winter and can be eliminated by overbrowsing. Honeysuckle is difficult to establish where an overpopulation of deer occurs, because they browse it so heavily.

Lay (1969) reports the best insurance for proper deer nutrition on forest range is maintenance of maximum habitat variety. Maintaining natural wildlife openings and use of wildlife food plots in predominantly forested conditions is well documented and helps to accomplish this objective. Openings and food plots create the "edge effect" and supply habitat diversity. Although honeysuckle is not a panacea for use under forest canopy or in wildlife openings or food plots, it should be considered because of its easy establishment and maintenance on nearly any soil type and because of the quality and quantity of the forage produced.

ACKNOWLEDGEMENTS

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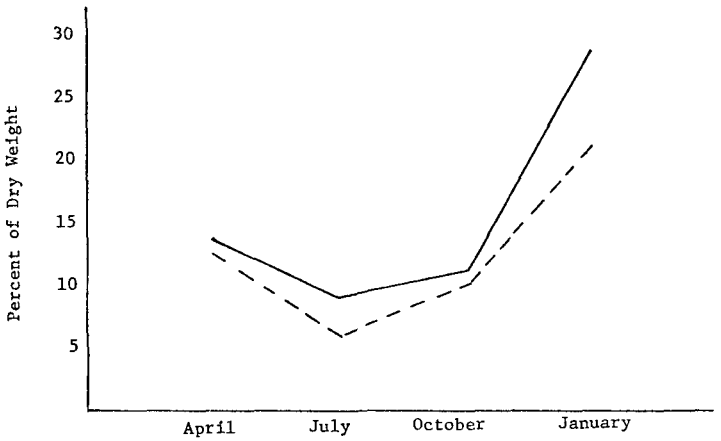
Figure 1



Protein Content of Leaves by Seasons, 1970-71
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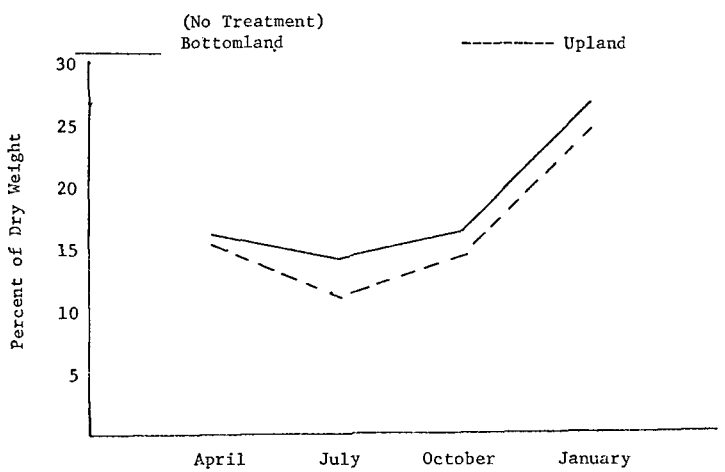

Protein Content of Leaves by Seasons, 1971-72
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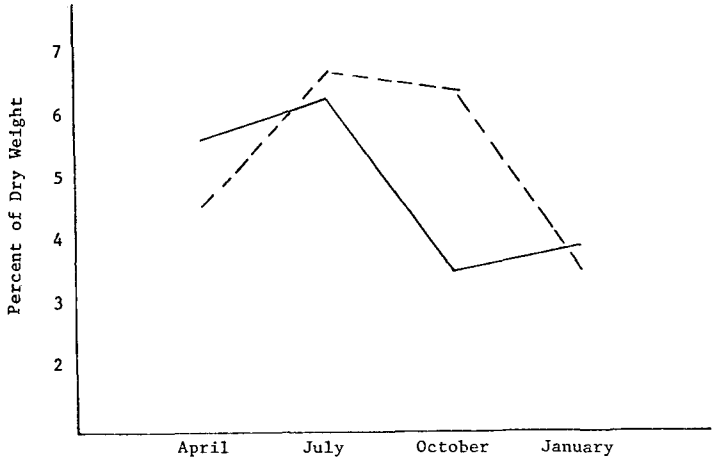
Figure 2



Crude Fat Content of Leaves by Seasons, 1970-71
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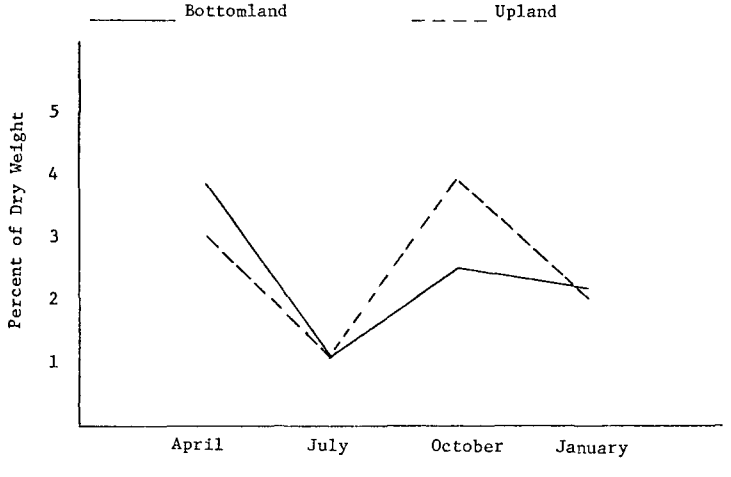

Crude Fat Content of Leaves by Seasons, 1971-72
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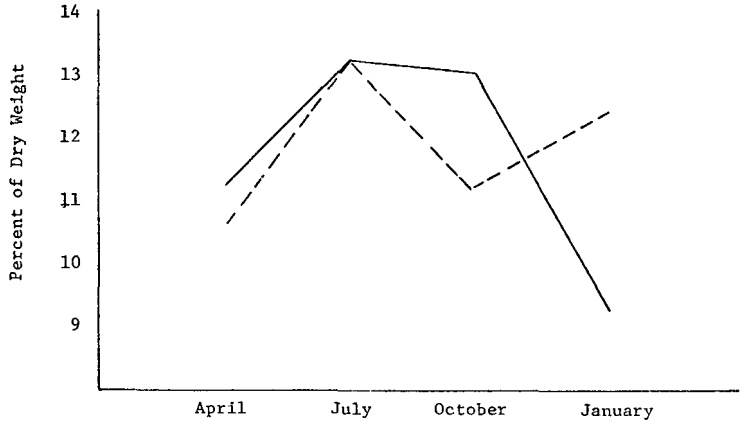
Figure 3



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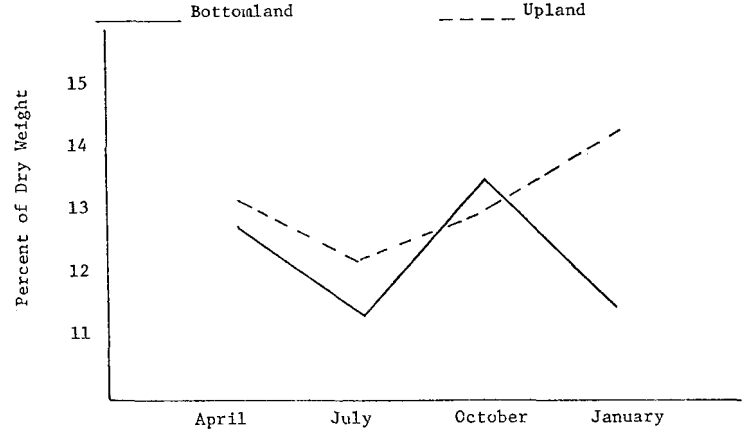

Fiber Content of Leaves by Seasons, 1971-72
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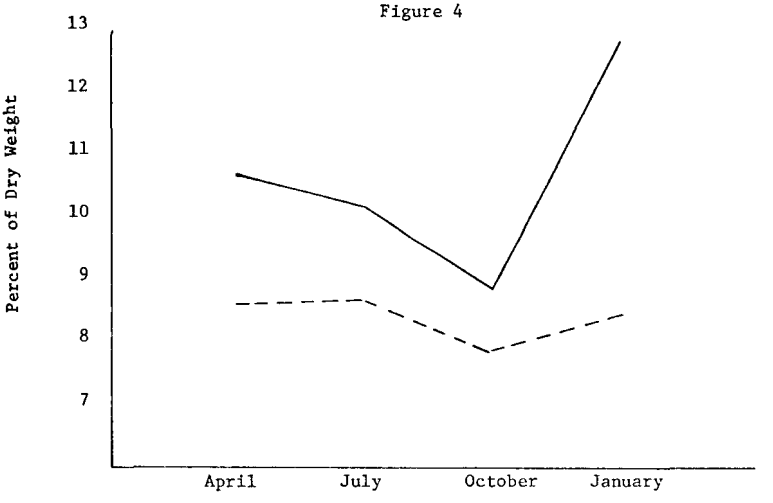
Figure 4



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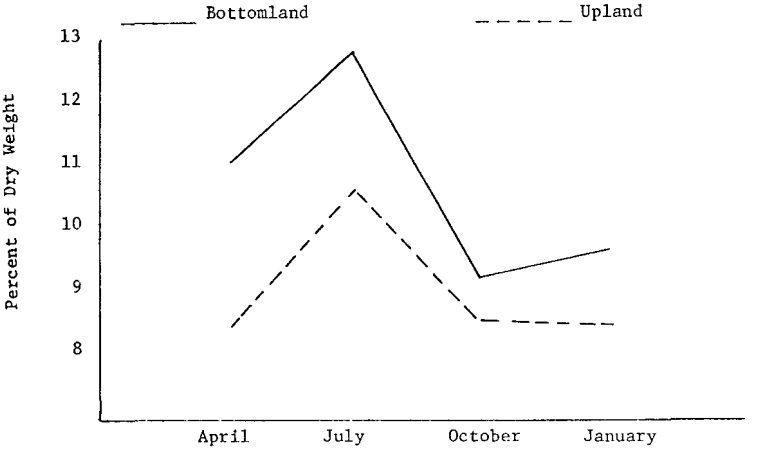

Ash Content of Leaves by Seasons, 1971-72
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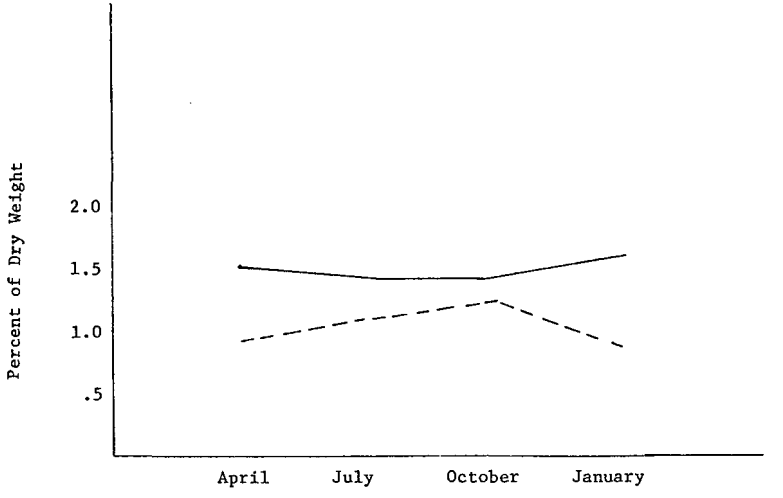
Figure 5



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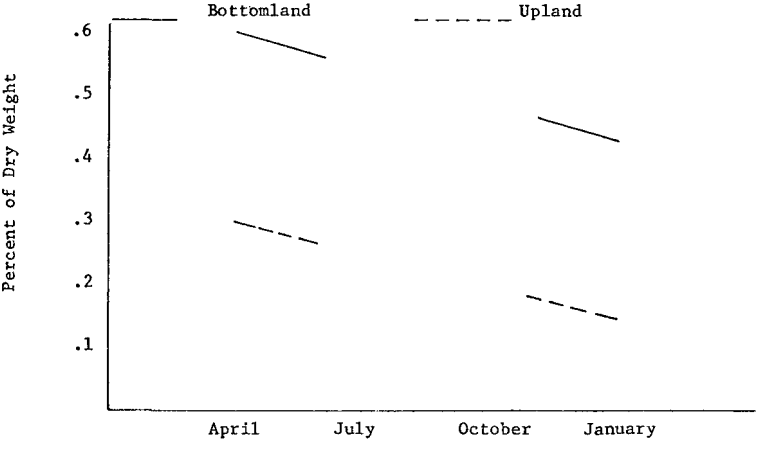

Calcium Content of Leaves by Seasons, 1971-72
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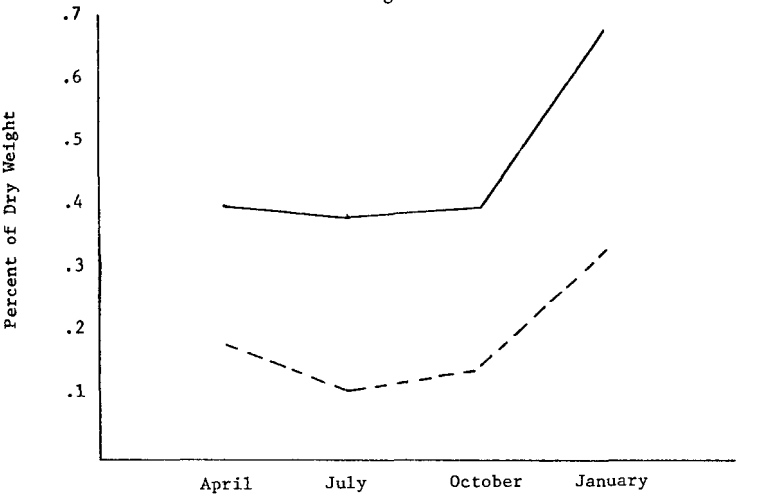
Figure 6



Phosphorous Content of Leaves by Seasons, 1970-71
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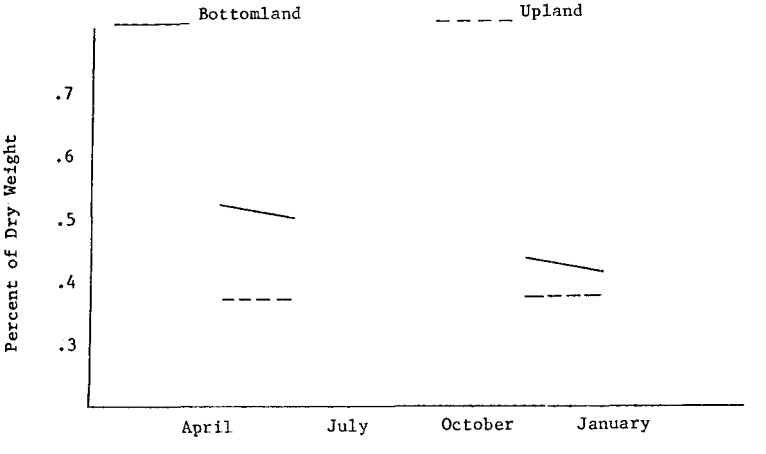

Phosphorous Content of Leaves by Seasons, 1971-72
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