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AN EVALUATION OF A RESEEDING VETCH, CLANTON TICK-CLOVER, AND A LOW-TANNIN SELECTION OF SERICEA LESPEDEZA AS QUAIL FOOD AND COVER PLANTS[1]

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INTRODUCTION

The need for better quail food and cover plants is widely recognized. This paper describes experiments with three plants that were thought promising.

Two plants tested were perennial legumes, Clanton tick-clover (a strain of *Desmodium perplexum*) and a low-tannin selection of sericea *(Lespedeza cuneata)* and one was a reseeding annual legume, a hybrid vetch resulting from a cross between *Vicia sativa* and *Vicia cordata.*

[1]A contribution of the Alabama Cooperative Wildlife Research Unit, Auburn University, Game and Fish Division of the Alabama Department of Conservation, the U. S. Fish and Wildlife Service and the Wildlife Management Institute, cooperating. Presented at the 22nd Annual Conference of the Southeastern Association of Game and Fish Commissioners.

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Clanton tick-clover was found in Alabama in 1947 and then tested by the Soil Conservation Service as a hay or silage crop as well as a quail food and cover plant (Graetz and Young, 1960). It was selected for evaluation by the Cooperative Wildlife Research Unit for the following reasons: (1) its growth characteristics are such that it showed promise as a replacement for bicolor *(Lespedeza bicolor)* which has been a problem to control on some regularly burned areas in Alabama, (2) in central Alabama native perennial desmodiums (including *D. perplexum*) are preferred by quail above other native legumes, (3) desmodiums have responded better to fire and fertilizer than some other native legumes (Speake, 1966).

E. D. Donnelly developed the reseeding vetch at Auburn University from a cross between *Vicia sativa* and *V. angustifolia* (later classified *V. cordata*) made by Donnelly and Clark (1962). The development of the reseeding vetch stemmed from a need to extend the grazing season and to improve forage quality in the southeastern United States.

After a period of selective breeding, an interspecific hybrid, *Vicia sativa* x *V. cordata,* was obtained. Advanced generation lines from this interspecific cross are genetically stable and have large seed and vigorous seedlings that can emerge through thick grass.

The high percentage of hard seeds that lie dormant during the hot, wet summer enables this hybrid to reseed. The seed mature in late May or early June. Commercial seed harvest is made possible by the non-dehiscent seed-pod characteristic of this hybrid. The seed germinate when the cooler autumn temperatures and adequate moisture prevail. Seed of the hybrid progeny when unscarified germinate more readily at low temperatures (Elkins, Hoveland, and Donnelly, 1966). It is thought that the low temperature effect is comparable to scarification. These lines are resistant to the vetch bruchid (*Bruchus brachialis* Faho.) and three species of root-knot nematodes (Donnelly and Hoveland, 1966).

Donnelly also developed the low-tannin sericea seed tested in this study. This strain of sericea was selectively bred for plants which contained less tannin than the original parent strains. The purpose of developing a low-tannin strain was to produce a more palatable forage crop for cattle. It was hoped that the lower tannin content of the new sericea, which presumably would be more palatable to cattle, would also produce seed more palatable to quail than seed of common sericea.

DESCRIPTION OF THE STUDY AREA

The study area was located on the Hugh Kaul estate, a 5,000-acre quail management area located 13 miles south of Sylacauga, Coosa County, Alabama. The area is in an isolated longleaf pine forest type within the Piedmont Plateau Soil Province. Two plant communities are found on this area: the longleaf pine hilly woods and the hardwood valleys.

The longleaf pine hilly woods plant community is composed of homogenenous open stands of cutover, second growth longleaf pine that have been selectively cut since 1943. Timber stand improvement has resulted in the removal of most hardwood bottoms. A controlled burning program was started in 1951 and has been continued on a two year cycle.

The land is not suited for cultivation because it is hilly and steep with shallow, highly acid soil. The study plots were located on areas of Talladega gravelly silt loam smooth phase soil. The management area was begun in 1950, and work on it has continued until present. Numerous food plots have been established, most of which are bicolor plots. For a detailed description of this area consult McConnell (1965).

METHODS

Establishment and maintenance of tick-clover and vetch

Twenty-two tick-clover plots were established over a period of three years, 1964, 1965, and 1967 (Figure 1). In June, 1964, eight tick-clover plots from one-fourth to one-third acre in size were established. Four of these plots were planted adjoining

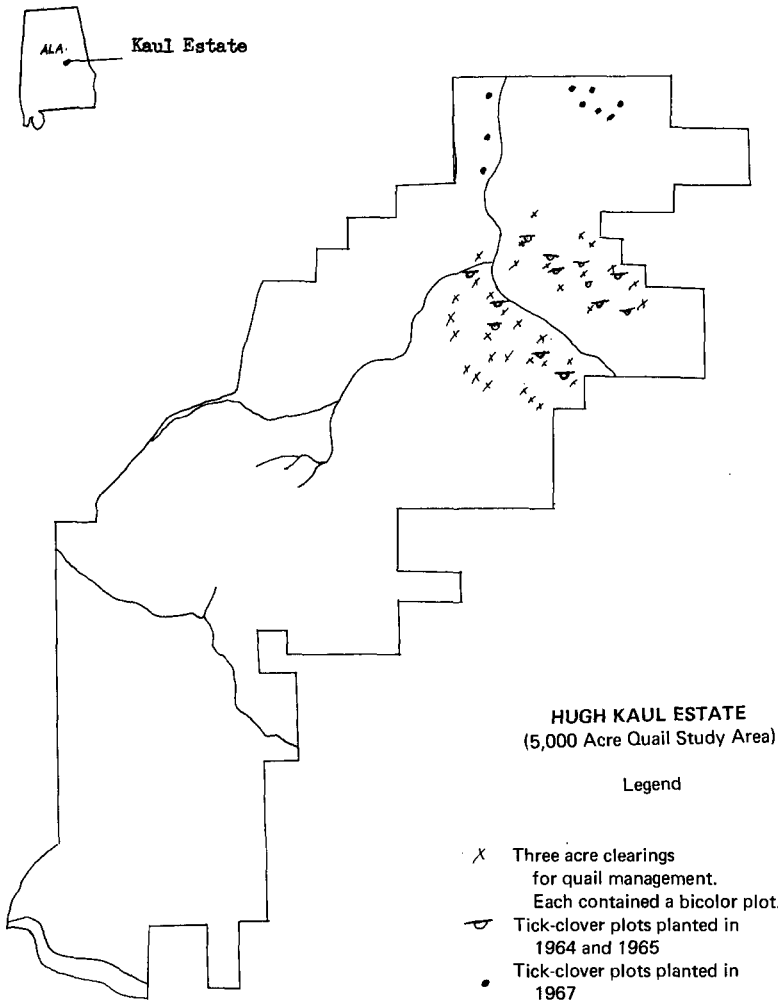

Figure 1

bicolor plots on old cowpea sites. The remaining four plots were located 40 yards or more from bicolor plots. Plot sites were cleared when necessary and the seed beds prepared. Based on soil test recommendations two-and-one-half tons of basic slag per acre were applied by spreader truck. Potash was applied at the rate of 50 pounds per acre. After the slag and potash were disked into the soil, furrows were laid off three feet apart using a mule, plow stock, scooter, and scrape. The seed were planted very shallow in rows using a Planet Jr., Model 300-A. These plots were plowed and hoed the first year.

Five more tick-clover plots were established June 21, 1965, southwest of the 1964 planting. These plots were not located adjoining bicolor but were within 40-50

yards of bicolor plots. No maintenance other than burning was provided for these areas.

Nine additional tick-clover plots were established in April, 1967, on a part of the study area isolated from other quail food plots but similar in all other respects to the sites seeded in 1964 and 1965. These plots will be referred to as "isolated" tick-clover plots. Three of the new plots were broadcast with tick-clover. These broadcast plots were prepared with a disk harrow just prior to planting. A cyclone seeder was used to broadcast the seed at a rate of 7.5 pounds per acre. The seed were then covered very shallowly by using a tractor to drag the plot. The remaining six plots were planted in rows. Rows were laid off three feet apart and tick-clover was sown at the rate of 4.5 pounds per acre.

Reseeding vetch plots were established in 1964 and 1967. Two of the 1964 vetch plots were adjoining 1964 tick-clover plots, and the other vetch plots were located in areas with no other food plots nearby. The plots were prepared using methods similar to those used in the preparation of the 1964 tick-clover sites. The 1964 and 1967 vetch plots were fertilized according to soil test recommendations and planted in late October and early November. Inoculated seed were broadcast at the rate of 35 pounds per acre and the seed were covered by disking lightly.

Palatability tests of vetch, tick-clover, and low-tannin sericea seed

A test was conducted to determine the palatability of the three legume species in relation to quail food known to be palatable. This test had two parts; one consisting of feeding pen-reared quail under controlled conditions for 32 days and the other consisting of feeding wild quail that had been trapped and penned for 24 days.

In the first series six pen-reared bobwhite quail were individually placed into six adjacent wire cages in a laboratory. These birds were young of the year, hatched and grown indoors on a diet of turkey starter.

Poultry feed trays were divided into four sections and the experimental foods were offered systematically along with known choice foods. The combinations of food and number of days each combination was offered were as follows: scratch grain, turkey starter, low-tannin sericea, and common sericea — 7 days; tow-tannin sericea and common sericea — 4 days; low-tannin and common sericea — 6 days; reseeding vetch, tick-clover, low-tannin sericea, and bicolor — 11 days; vetch and bicolor — 4 days. As indicated above, the low-tannin and the common sericea seeds were offered twice. The quail lost weight rapidly on the sericea diet and had to be recuperated before continuing this test diet. Both types of the sericea seeds were fed unhulled.

A second series of tests was conducted using wild quail. Eleven quail were captured and placed in a 10.5' x 6.0' pen near the capture site. Individual quail feeders were used and each feeder was numbered according to the particular food it contained. The combinations of food and the number of days offered were as follows: cracked corn, reseeding vetch, low-tannin sericea, common sericea, tick-clover, and bicolor — 7 days; low-tannin sericea, common sericea, and bicolor — 5 days; common and low-tannin sericea, bicolor, and cracked corn — 12 days. The amounts of seed consumed by quail in all the feeding tests were measured at the end of each feeding period.

Field evaluation of quail use of tick-clover and reseeding vetch

In the evaluation of the tick-clover plots, weekly trips were made to the Kaul estate from September, 1967 to May, 1968. Tick-clover plots were hunted on foot with two dogs and records were kept on the number of coveys flushed per hunting party hour. When coveys were located away from food plots, they were assigned to the nearest food plot. Quail were shot and crops examined to determine the volume and occurrence of each species of seed.

The tick-clover plots were separated into two groups. Those planted within 200 yards of bicolor were placed in one group, and those "isolated" from bicolor were placed in another group. This division permitted a comparison of use between the plot locations.

The number of coveys located per hunting party hour was calculated for each month and averaged to give the number of coveys located per hour for each group of tick-clover plots.

Very little hunting was done in November and December because the quail were feeding almost entirely on pine mast during that time. Only one hunt was made in May.

Bicolor plots were hunted by the senior author and by Mr. Hugh Kaul, the landowner. Hunting records kept by Mr. Kaul were made available for the 1967-68 season, and data concerning the number of coveys flushed per hunting party hour from bicolor plots isolated from other types of food plots were taken from these records. A comparison was made of the number of coveys found in the tick-clover and the number found in bicolor per hour of hunting.

When the reseeding vetch matured, weekly trips were resumed. Vetch plots were hunted with dogs, and records were kept on the number of flushes made per hour. Birds were collected and crops were taken to determine the per cent volume and occurrence of species eaten. Crops from quail collected in vetch plots during the summers of 1967 and 1968 were analyzed.

Quail crop analysis

Crops used in this study were collected by both the senior author and the landowner. The crops were divided into three groups; those from "isolated" tick-clover plots, those from "isolated" bicolor plots, and those from areas where both tick-clover and bicolor were grown. As quail were collected in the field, tags (with date and location of kill) were attached to the legs. Information from the tags and the crop contents were stored in small paper cups. Tags and the crop contents were stored in small paper cups, which were held in refrigeration until their crop contents could be analyzed. The contents of each crop were sorted into groups of individual species of seed. Small seed were placed in calibrated glass cylinders and the volume read. The volume of larger species such as cowpeas and corn was measured using the lead shot displacement method (Korschgen, 1948).

Desmodium perplexum was often hard to distinguish from other species of desmodium. Desmodiums other than *D. perplexum* accounted for only a small portion of the quail diet in this area so no attempt was made to separate them.

RESULTS

Establishment and maintenance of tick-clover and vetch

The tick-clover in the four plots that were planted adjoining bicolor plots in 1964 survived but is gradually being replaced by more competitive bicolor. The tick-clover in the four plots planted near bicolor plots in 1964 has deteriorated to some degree because of lack of maintenance. The partial failure of the 1964 plantings was thought to have been the result of several factors. Tick-clover which was established adjacent to bicolor that year was not as competitive as bicolor and could at best only hold its own. One-half of the 1964 tick-clover plots were burned in 1965 and, according to the land manager, were in good condition following the burn. Since 1965 these plots have not been burned, but they were disked in 1967. Partial burns occurred on four of the 1965 tick-clover plots in the late winter of 1967. The beneficial influence of fire was readily detectable in the form of reduced litter and weeds, increased growth rates and reproduction. It seems that fire is very useful in the maintenance of tick-clover. After several years of establishment, additional fertilization would probably aid this legume.

The tick-clover plots established in 1965, none of which were established directly adjacent to bicolor plots, have done extremely well. The nine tick-clover plots planted in 1967, some of which were broadcast seeded rather than seeded in rows, have been very successful.

The vetch established in 1964 did not reseed well. It is thought that the failure to reseed was caused by at least two factors: abnormal weather conditions and quail

eating most of the vetch seed. Larger plots would provide more seed and aid reseeding of the vetch.

Stands of the reseeding vetch can be obtained by simply broadcasting seed on unprepared soil which has been fertilized according to soil test recommendations or by planting on a prepared seed-bed according to standard cultural methods.

Palatability tests of vetch, tick-clover and low-tannin sericea seed

When offered a choice of only sericea, the pen-reared quail consumed 263 cc of low-tannin sericea and 274 cc of common sericea seed in the first series of palatability tests. The same comparison using wild-penned quail showed that they consumed 250 cc of low-tannin sericea seed and 404 cc of common sericea seed during the second series of palatability tests. These tests indicated that there was no advantage in using the low-tannin instead of the common sericea lespedeza seed. The results shown in Tables 1 and 2 are representative of the tests conducted.

TABLE 1

Food Consumption of Six Pen-reared Bobwhite Quail During an Eleven Day Palatability Test Using Low-tannin Sericea, Bicolor Lespedeza, Clanton Tick-clover, and Reseeding Vetch During 1968.

	Volume of seeds consumed (cc)			
Number of Days Offered	Reseeding Vetch	Tick-Clover	Bicolor	Low-tannin Sericea
2	91	39.0	47	9
2	117	112.0	48	4
2	99	77.0	17	6
5	120	120.0	89	4
Total	427	348.0	201	23
Average daily consumption	38.8	31.6	18.3	2.1

TABLE 2

Amounts of Six Varieties of Seed Selectively Ingested by Eleven Penned Wild Bobwhite Quail During a Seven Day Palatability Test Conducted During January, 1968.

		Volume of seeds consumed (cc)				
Number of Days Offered	Corn	Reseeding Vetch	Low-tannin Sericea	Common Sericea	Tick-Clover	Bicolor Lespedeza
2	100*	55	0	10	17	0
3	100*	100*	0	0	55	10
2	100*	100*	0	0	100*	80
Total	300	255	0	10	172	90
Average daily consumption	42.9	36.4	0	1.4	24.6	12.9

*The amount of each species offered during each feeding period was 100 cc.

The following foods are listed in order of preference when offered to both groups of birds: vetch, tick-clover, bicolor. Vetch and tick-clover seemed to rank high in preference in both the pen-reared and wild-penned quail tests. Due to the apparent

low preference for the seed from low-tannin sericea, it was dropped from further consideration. Since this work was conducted, further studies at Auburn University showed that seed coat tannin content of both low and high tannin sericea lines is high, about 9.0 percent. Results of this study indicate that the seed coat stores large amounts of tannin. This may explain why quail do not prefer sericea seed.[5]

Field evaluation of quail use of reseeding vetch and tick-clover

From the last week in December through the first week in May, fifty-three coveys were flushed during 13 trips to the nine "isolated" tick-clover plots planted in 1967. Eight of the nine plots supported a covey of quail each.

An average of 1.3 coveys per hunting party hour was found in the nine "isolated" tick-clover plots (Table 3).

The 1964 and 1965 tick-clover plots were either planted adjoining or near bicolor. These plots comined yielded 1.4 coveys per hunting party hour (Table 4). The 1964 tick-clover plots were hunted six times in which 20 coveys were located, and 1965 tick-clover plots were hunted eight times in which 23 coveys were located.

TABLE 3

Number of Coveys Located Per Hunting Party Hour in "Isolated" Clanton Tick-clover Plots (1967-68).

Month	Hunting House	Number Coveys	Average No.oof Coveys Per Hour
December	3.5	7.0	2.0
January	15.3	16.0	1.1
February	5.4	7.0	1.3
March	8.7	10.0	1.2
April	7.5	11.0	1.5
May	1.0	2.0	1.0
Total	41.4	53.0	
Average			1.3

The "isolated" bicolor plots were evaluated by using data taken from the landowner's hunting records. Only data indicating the hours hunted and the number of coveys located per trip in "isolated" bicolor were used.

As shown in Table 5, the largest number of coveys located per hunting party hour occurred in December. The average number of coveys located per hunting party hour for the entire season was 1.4. The hunting parties usually used three dogs and rode horses, whereas the investigator walked and used two dogs. Since more plots can be hunted per hour from horseback than on foot, these data are biased in favor of bicolor. The number of coveys flushed per hunting party hour in the "isolated" tick-clover plots (1.3) was similar to the number of coveys flushed per hour in the tick-clover near bicolor (1.4).

If the coveys per hunting party hour located in "isolated" tick-clover (1.3) is compared with coveys located per hunting party hour in "isolated" bicolor (1.4), it appears tick-clover attracts and holds quail as well as or better than bicolor. Not only did tick-clover attract and hold quail, but it was also much easier to hunt. One could easily see a covey rise from the waist high tick-clover. Bicolor often grows higher than a man's head and acts as a screen to hide flushing coveys. Dogs which were often lost from view in bicolor could easily be seen in tick-clover plots.

The nine vetch plots were hunted eight times from the first week in June through the first week in August. Numerous quail dusting sites were found in all of the plots during this time. Quail were flushed 31 times during this period for a total of 1.3 flushes per hour.

[5] Logan, R. H., C. S. Hoveland, and E. D. Donnelly. Unpublished data.

TABLE 4

Number of Coveys Located Per Hunting Party Hour in Clanton Tick-clover and Adjoining or Near-by Bicolor (1967-68).

Month Hunted and Year Planted	Hunting House	Number Coveys	Average No. of Coveys Per Hour
January			
1964	6.0	3.0	0.5
1965	1.8	4.0	2.2
February			
1964	5.2	5.0	1.0
1965	4.5	4.0	0.9
March			
1964	3.0	1.0	0.3
1965	3.3	5.0	1.5
April			
1964	3.3	11.0	3.4
1965	3.6	9.0	2.4
May			
1964	**	**	**
1965	0.5	1.0	2.0
Total			
1964	17.5	20.0	
1965	13.7	23.0	
Combined	31.2	43.0	
Average			
1964			1.2
1965			1.8
Combined			1.4

TABLE 5

Number of Coveys Located Per Hunting Party Hour in "Isolated" Bicolor Plots (1967-68).

Month	Hunting Hours	Number Coveys	Average No. of Coveys Per Hour
November	5.5	6.0	1.0
December	43.3	88.0	2.0
January	67.9	81.0	1.2
February	68.2	86.0	1.3
Total	185.0	261.0	
Average			1.4

Quail crop analysis

The main objective of the crop analysis was to ascertain the degree of usage of the tick-clover and reseeding vetch as quail food. Bicolor is more available and has been the most important single quail food on the area. McConnell (1965) found that bicolor made up 76.2 per cent by volume and occurred in 80.9 per cent of crops collected during the 1964-65 season on this entire study area. *Desmodium spp.* accounted for only 0.4 per cent by volume and occurred in only 10.0 per cent of the crops during the same period. These results which were obtained before Clanton

tick-clover and vetch were available in significant amounts, may be compared to the 1967-68 results.

Thirty-four crops were analyzed from "isolated" tick-clover plots in 1967-68. These crops were collected during the period from December through March.

Desmodium spp. (assumed to be nearly all *D. perplexum*) made up 94.0 per cent by volume and occurred in 97.1 per cent of these crops (Table 6). No bicolor was found in these crops as none was available in this area. The sample indicates tick-clover was heavily utilized by quail. It was noteworthy that these newly established tick-clover plots (planted in 1967) attracted and held coveys the first year.

TABLE 6

Contents of 34 Quail Crops Taken From "Isolated" Clanton Tick-clover Plots on the Kaul Estate (1967-68).

Item	Percentage by Volume	Percentage by Occurrence
Desmodium spp.	94.1	97.1
Insects	0.5	14.7
Poa sp.	Trace	5.9
Snails	Trace	5.9
Galactia volubilis	1.2	44.1
Chamaecrista spp.	0.6	8.8
Centromsema sp.	Trace	11.8
Vegetative fragments	1.0	38.2
Lespedeza spp	1.5	14.7
Quercus spp	0.2	5.9
Triticum aestivum	0.7	5.9
Vicia sp.	0.2	2.9
Ambrosia sp.	Trace	2.9
Unknown seeds	Trace	14.7

TABLE 7

Contents of 36 Quail Crops Taken from Clanton Tick-clover and Surrounding Bicolor (1967-68).

Item	Percentage by Volume	Percentage by Occurrence
Lespedeza bicolor	52.7	75.0
Desmodium spp.	35.7	94.4
Charaecrista spp.	0.1	16.7
Insects	0.9	19.4
Pinus sp.	1.7	11.1
Vegetative fragments	0.7	41.7
Vicia sp.	0.9	2.8
Galactia volubilis	0.9	25.0
Centrosema sp.	0.9	13.9
Snails	Trace	2.8
Lespedeza spp.	Trace	58.3
Zea Mays	1.7	13.8
Sorghum vulgare	3.4	5.6
Panicum spp.	Trace	2.8
Triticum aestivum	Trace	2.8
Debris	Trace	5.6
Rhus glabra	0.1	2.8
Glycine max	0.3	2.8
Unknown seeds	Trace	13.9

The crop content data reported in Table 7 came from areas where tick-clover and bicolor plots were grown close together. Tick-clover made up 35.7 per cent by volume and occurred in 94.4 per cent of the crops. Bicolor lespedeza accounted for 52.7 per cent by volume and occurred in 75.0 per cent of crops. Tick-clover coverage was only a small fraction compared to the bicolor coverage in these areas.

A sample of 28 crops was analyzed from "isolated" bicolor plots. The crops were not representative of the entire season since most of them were collected during December and January. Pine mast was abundant during this period as shown by the 26.0 per cent volume and 53.6 per cent occurrence (Table 8).

Bicolor accounted for 54.9 per cent of the volume and occurred in 92.9 per cent of the crops from the area where bicolor was the only available type of food plot. *Desmodium spp.* accounted for 4.9 per cent by volume and occurred in 76.9 per cent of these crops. The *Desmodium spp.* in this case is presumed to have come from wild plants.

TABLE 8

Crop Contents of 28 Quail Taken from "Isolated" Bicolor Plots on Kaul Estate (1967-68).

Item	Percentage by Volume	Percentage by Occurrence
Lespedeza Bicolor	54.9	92.9
Desmodium spp.	4.9	76.9
Vegetative fragments	1.9	42.9
Lespedeza spp.	0.8	42.9
Quercus spp.	0.4	3.6
Charaecrista spp.	0.9	21.4
Galactia volubilis	0.2	32.1
poa sp.	Trace	3.6
Pinus sp.	26.0	53.6
Centrosema sp.	Trace	10.7
Panicum sp.	Trace	7.1
Insects	Trace	7.1
Snails	Trace	7.1
Sorghum vulgare	7.1	7.1
Zea Mays	2.8	3.6
Unknown seeds	Trace	10.7
Apios americana	0.2	7.1

Crops collected from the reseeding vetch plots on the Kaul estate in the summer of 1967 and crops from reseeding vetch patches located at the Auburn University Agricultural Experiment Substation at Camp Hill, Alabama, were analyzed with the crops collected by the senior author in the summer of 1968.

A total of 16 crops was collected in 1967 and 14 in 1968. As shown in Table 9, vetch accounted for 79.8 per cent volume and occurred 83.3 per cent of the time. This sample indicated that vetch was heavily utilized by quail.

DISCUSSION AND CONCLUSIONS

Tick-clover was found to be a good plant for quail management. This plant provided food and cover that was heavily utilized by quail from fall through early spring. The height of the plant did not interfere with visibility when hunting quail. Tick-clover was well adapted to a habitat maintained by fire.

Reseeding vetch was heavily utilized by quail during the summer months. When unusual weather conditions occur this legume may not reseed very well. A management technique for maintaining this crop is needed, but it is possible to maintain vetch plots by adding seed each year.

TABLE 9
Crop Contents of 30 Quail Taken from reseeding Vetch Plots (1967-68).

Item	Percentage by Volume	Percentage by Occurrence
Vicia sp.	78.8	83.3
Panicum fasciculatum	13.1	13.3
Insects	4.3	66.6
Lespediza bicolor	Trace	6.6
burus sp.	Trace	20.0
Desmodium spp.	Trace	6.6
Vegetative fragments	Trace	3.3
Glactia volubilis	Trace	3.3
Panicum spp.	Trace	20.0
Lespedeza sp.	Trace	6.6
Vaccinium sp.	2.0	23.3
Snails	Trace	6.6
Triticum aestivum	Trace	3.3
Chamaecrista spp.	Trace	3.3
Quercus sp.	Trace	3.3
Unknown seeds	0.7	3.3

The low-tannin selection of sericea seed was not preferred over common sericea seed and it is not recommended as a quail food plant.

SUMMARY

A low-tannin selection of sericea lespedeza, a reseeding vetch, and Clanton tick-clover were evaluated as possible quail foods.

Plots of tick-clover and reseeding vetch were planted in 1964, 1965, and 1967 on an established quail management area. Several methods of seed-bed preparation, seed distribution, and fertilization were tried.

A palatability test using pen-reared and wild-penned bobwhite quail was conducted in 1967. Pen-reared quail were offered turkey starter, corn, reseeding vetch, Clanton tick-clover, bicolor lespedeza, low-tannin sericea lespedeza, and common sericea lespedeza using several combinations. The wild-penned quail were offered the same foods with the exception of turkey starter.

Quail use of the plots was evaluated in fall, winter, spring, and summer of 1967-68 by flushing coveys from the patches and keeping records on the number of coveys flushed per hunting party hour and the distance the covey was found from the food patch. Quail were collected and the crop contents were analyzed.

Data concerning the hunting results on the numerous bicolor lespedeza plots were made available by the land owner. Hunting success in the bicolor and tick-clover plots was compared.

In the establishment of the vetch and tick-clover plots, fertilized according to soil tests, it was found that tick-clover grew well either broadcast or planted in rows. The broadcast plots had fewer weeds because the tick-clover formed a complete stand. Burning in the late winter or early spring greatly improved the quality of three year old tick-clover plots.

The palatability test using pen-reared and wild-penned quail showed that the low-tannin selection of sericea lespedeza was very low in preference, therefore, the sericea was dropped from further consideration. The reseeding vetch and tick-clover were more palatable than bicolor lespedeza according to these tests.

The tick-clover plots were utilized heavily by quail after pine mast had disappeared in the fall. The birds continued to use the tick-clover until the reseeding vetch matured in the spring. Pairs, single birds, and young coveys of quail utilized the vetch plots heavily during the summer.

Tick-clover plots held as many coveys as did the bicolor patches on the study area. Crop analysis revealed that quail relied on the tick-clover for most of their food in the tick-clover patches where no bicolor lespedeza plots were close by. Hunting in the tick-clover was much easier since it does not grow nearly as high as bicolor.

Tick-clover is considered to be a successful winter food plant and reseeding vetch a successful summer food plant on this quail management area.

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SMALL FOREST HOLDINGS COULD BE COMBINED FOR HUNTING LEASES

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ABSTRACT

Most forest land acreage in the South is in small holdings. Much-needed hunting land, and income for rural landowners, could be provided by combining small forest holdings into large units and leasing the hunting rights.

INTRODUCTION

The present demand for hunting land is expected to double by the year 2000 (Outdoor Recreation Resources Review Commission, 1962). Who is going to supply this extra hunting and how?

In the South, the "who" will most likely be the owners of small forests. There are two main reasons. First, the forest is the natural abode of most upland game species. Even some of the so-called farm game, such as bobwhite, depend upon the forest for

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