SEASONAL AVAILABILITY OF CERTAIN QUAIL FOODS AS DETERMINED FROM GROUND SAMPLES

ARNOLD C. HAUGEN, Alabama Cooperative Wildlife Research Unit, Auburn, Alabama
FRANK W. FITCH, JR., Alabama Cooperative Wildlife Research Unit, Auburn, Alabama

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Marco Polo, in his travels in the Far East, found Kublai Kahn using food patches for game in the year 1270. This is the earliest recorded use of food plots for wildlife. In America, Pennsylvania is credited with being first to utilize such food patches (1917). Since that time, the use of food plantings has become a general practice for certain species. In the earlier years of experimental use of game food patches in the United States, mostly annual grains were planted.

Many of the grains tried in earlier years were found to be readily accepted by quail; the difficulty with such grains, however, was that they required annual cultivation. Then, too, the grains were taken by a host of other species, which depleted the supply of food before the winter season of food shortage arrived.

In about 1940, game authorities in the Southeast became interested in *Lespedeza bicolor* as a quail food plant. This shrubby lespedeza had first been introduced from Asia as an ornamental, later it was used some as an erosion control plant for gullies. The first records of bicolor serving as an important source of food for quail were obtained at Rock Hill, South Carolina in the winter of 1938 - 39 (Davison 1943). Experimental work with bicolor at the Alabama Cooperative Wildlife Research Unit began in the spring of 1941, when transplants were received from the Soil Conservation Service Nursery at Thorsby, Alabama. The second fall thereafter, quail were found making extensive used of this new food supply (Pearson 1943). Game authorities eagerly accepted the bush lespedezas, because they were perennials. In the past 10 years, the use of bicolor for quail habitat development has become widely accepted. Authorities in the Southeastern states in the year 1950 - 51 distributed roughly 39 million bicolor seedlings and 19 thousand pounds of seed (Warvel 1951). In the year 1952, 1,935,000 bicolor transplants and 2,773 pounds of seed were distributed by the Alabama Department of Conservation. Some other states are believed to have distributed even more.

The State of Florida currently is using considerable *Lespedeza thunbergii* for quail food patches. Virginia and Kentucky are experimenting with *Lespedeza japonica.* Some of the more northern states are working with *Lespedeza bicolor.*

Some states, especially Alabama, have recommended large partridge peas, *Chaemaecrista fasciculata (Cassia fasciculata),* for quail management. The partridge pea, it was found, while only an annual, reseeded itself fairly well and thereby maintained a satisfactory stand for three or four years. The Alabama Department of Conservation distributed 1,588 pounds of partridge pea seed in 1952. Requests by farmers for both bicolor and partridge peas, far exceeded the planting stock available for distribution.

Until the present time, the yield of these various quail food plants has been compared only on the basis of annual production of seed that could be harvested either by hand or by combine.

This study reports a new technique that has made it possible to measure and compare relative availability of seed to quail. Availability is based on the volume of seed recovered from square-foot samples of ground surface in the patches. Comparisons have been made on a seasonal basis.

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The help of several students in collecting and cleaning the ground samples is sincerely appreciated.

METHODS

Field Collection

Equipment for collecting ground samples for the quail food availability studies consisted of a wooden frame with an opening exactly one foot square, a knife with a 7-inch long blade, and a small scoop made from a piece of sheet iron.

The ground samples were collected on a random basis. Once inside the boundary of the study plot, the collector paced off five steps. At this point he placed the square collecting frame at the toe of his right foot. The knife was then used to cut all the vegetation around the inside of the frame. The vegetative matter, including leaves, grass, and other litter, was next scraped from the inside of the frame and put into a number sixteen bag. Care was exercised to make certain that all loose material was scraped clean to solid earth so that no seed would be left in the one square-foot sample. Information recorded on the bag included the patch number, date, species, and sample number. The operator then stepped off an additional five paces, at which point he placed the frame as before and collected the second sample. This process was repeated until the total number of samples for that period had been collected. The number of samples per patch per collection varied from 12 to 20, with 15 being eventually selected as adequate for the purpose. Collections made within a given season were combined in computing the average availability. Samples collected from the various patches were brought into the laboratory and temporarily stored on shelves until the material was thoroughly dry.

Separating seed

The actual process of separating the seed from the debris consisted of two principal steps.

1. The dried material was crushed between the hands and was then put into the hopper of a small "Grain, Seed and Bean Cleaner" called "The Clipper," manufactured by the A. T. Ferrell and Company, Saginaw, Michigan. The material was re-run through this cleaner as many as four to five times in order to remove as much as possible of the debris from the seed.

   For partridge peas a bottom screen with round 1/12-inch holes and a top screen with slits 6/64-inch wide by 3/4-inch long were used in the seed cleaner. For bicolor a bottom screen with round holes 7/64-inch in diameter and a top screen with oblong slits 6/64-inch by 3/4-inch were utilized. A few very small bicolor seed may have been lost in the cleaning process.

However, repeated checks on technique indicated that such loss was negligible.

Material in the seed tray at the end of this cleaning process included not bicolor seed, but also a number of particles of gravel and soil of approximately the same size as that of the seed.

2. The second step of the seed separation process consisted of putting the sample into a beaker of alcohol and stirring the contents. The particles of gravel and seed sank, while the light debris floated on the surface of the alcohol from where it was skimmed and discarded. The heavy material consisting of seed, rock, and some soil particles was then strained from the alcohol and permitted to dry for a few minutes. This material was next placed in a solution of carbon tetrachloride, the specific gravity of which caused the seed and a few porous soil particles to float while gravel particles sank to the bottom. The floating material, consisting primarily of clean seed with some soil particles of similar size and specific gravity, was then skimmed from the surface and put on a paper towel to dry. A pair of tweezers was next used to separate the seed from the soil particles. The seed were next measured for volume in a 10 cc graduate.

Seed availability data for various months have been combined and presented as samples of three seasons during each year; namely, winter (January - April), summer (May - September), and fall (October - December).

RESULTS

Information on the relative abundance of seed per one-square-foot sample is believed to be adequate for determining comparative abundance. This is supported by the relative distribution of volume of seed per sample as indicated in Fig. 1, 2, 3, 4, 5, 6.

On the basis of square-foot ground samples, established patches of bicolor (unimproved strain) are dependable sources of food in all seasons and from year to year. Series A and E in Table 1 are both developed productive patches. Series A, which was planted in 1945, had not been combined in the past four years. Whether or not the area sampled had been combined previous to that is not known. On the basis of 287 samples, the seed available on the ground in this patch were found to range from 4.7 cc/sq. foot in the fall of 1950, to 15.8 cc/sq. foot in the winter of 1951 (Table 1). In the winter of 1950, 10.4 cc of seed per square foot were found. Since a full quail craw is about equal to 10 cc, this means that there was available approximately one craw full per square foot. The trend in availability during the winter season in 1950, 1951, and 1952, shows that the patch had an increasing surplus of seed that is accumulating each year (Fig. 2).

Patch E, which has been combined for seed each fall, had a supply of 9.7 cc/sq. ft. in winter, 1951, and 7.8 cc/sq. ft. in the winter of 1952. A harvest of 125 lbs. clean seed per acre was taken from this patch in November of 1952. At this rate, roughly 1.7 cc per square foot were removed by combining. The efficiency of the harvesting operations, as influenced by a hard rain or wind on the plants when the seeds are ripe, could easily cause the variation in seed availability shown in Patch E. In any event both quantities shown are more than adequate as a source of food for local quail populations.

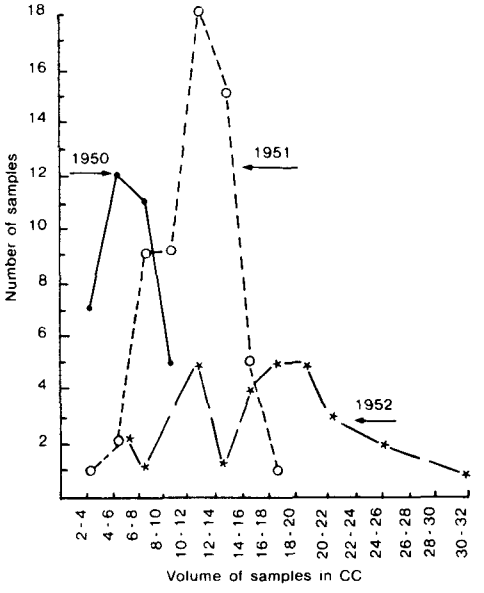

Fig. 1. Relative distribution of volume of bicolor seed per 1-square-foot sample gathered in the winter (Series A).

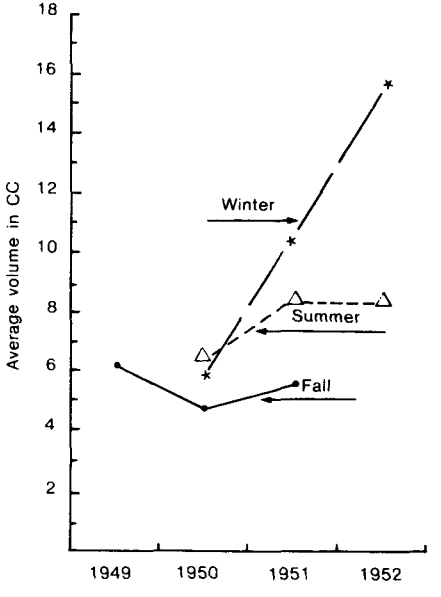

Fig. 2. Average volume of bicolor seed per square foot in various seasons and years (Series A).

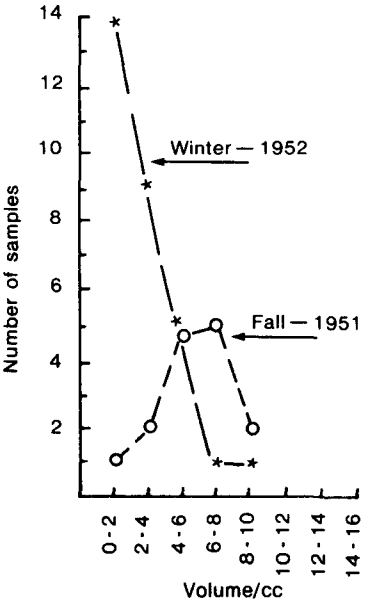

Fig. 3. Relative distribution of volume of *Lespedeza cyrtobotrya* seed per 1-square-foot sample.

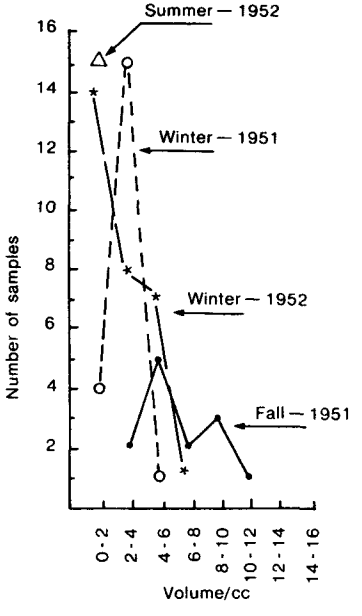

Fig. 4. Relative distribution of volume of *Lespedeza thunbergii* seed per 1-square-foot sample.

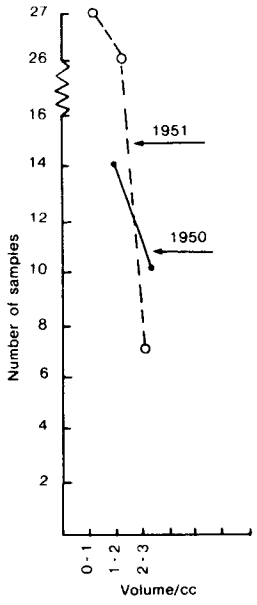

Fig. 5. Relative distribution of volume of partridge pea seed per 1-square-foot sample gathered in winter (Series B).

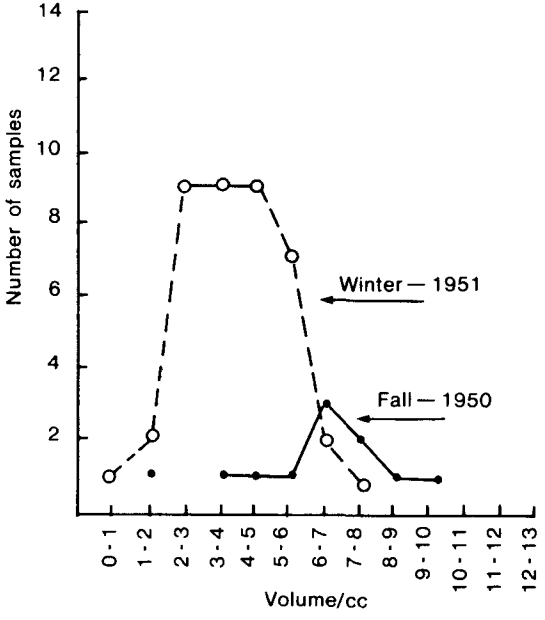

Fig. 6. Relative distribution of volume of partridge pea seed per 1-square-foot sample gathered in fall and winter (Series G).

Table 1. Seasonal availability of various quail foods in cc per square foot.

Species	Date planted		Available volume of seed								
			1949	1950			1951			1952	
			Fall	Winter	Summer	Fall	Winter	Summer	Fall	Winter	Summer
Lespedeza bicolor											
		cc	6.2	5.8	6.2	4.7	10.4	8.4	5.6	15.8	8.4
Series A	1945	lb./A	462	432	462	350	774	626	417	1177	626
		No. samples	12	35	24	40	61	40	30	30	15
		cc					9.7			7.8	
Series E	1945	lb./A					722			581	
		No. samples					20			15	
		cc				0.1	0.1			0.9	0.2
Series F	1950	lb./A				7	7			67	15
		No. samples				12	40			15	15
		cc					2.8		6.2	2.7	0.9
Lespedeza thunbergii	1945	lb./A					204		452	197	66
		No. samples					20		15	30	15
Lespedeza		cc							5.6	2.6	
cyrtobotrya	1945	lb./A							407	189	
		No. samples							15	30	
Chaemaecrista											
fasciculata		cc	2.6	1.7	1.2	2.1	1.2	0.7		0.5	
Series B	1945	lb./A	202	132	93	163	93	54		39	
		No. samples	13	24	35	20	60	40		15	
		cc				6.6	3.9				
Series G	1950	lb./A				512	302				
		No. samples				12	40				

It is of interest to note that Patch F had only 0.9 cc/sq. ft. in the winter following its second season of growth. Even though the individual plants were fully grown in height, the tops were not yet dense enough to produce a good seed crop.

Lespedeza thunbergii and *Lespedeza cyrtobotrya,* which occupied ground more fertile and moist than that on which the bicolor stands were located, were found low in food availability during winter in comparison to the equally old stand of bicolor (Table 1). The availability of seed of these two species during fall of 1950, however, was approximately equal to that for bicolor.

The figures for thunbergii and crytobotyra indicate that much of their seed may be depleted rather quickly during fall and winter. Since the seed of these species is about twice as large in size as that of bicolor, it is conceivable that competing species as well as quail might deplete the supply more quickly. Information on utilization of these two species of plants by rodents and non-game birds is not available at this time.

Studies on partridge pea availability were made on two patches, a new good first year stand (Series G) and an old stand (Series B) that was in its fourth year when the study started. The availability of partridge pea seed during the first fall, as shown by Patch G (6.6 cc/sq. ft.), is approximately equal to the food supply available in a well established bicolor, thunbergii, or cyrtobotrya patch, but that the winter availability is below that for bicolor. Data on Series B show that by the time a pea patch is 4, 5, 6, and 7 years old without benefit of maintenance (disking or fire), it is very low in production of seed.

Information on relative size, volume, and numbers of seed per pound is given in Table 2. The computations on numbers of seed per cubic centimeter and pound are based on the samples involved in Table 1.

Table 2. Comparative data on volume and number of seed per pound of certain quail foods.

Species	Vol. in cc/lb.	No. seed/cc	No. seed/lb.
Lespedeza bicolor	585	135	78,975
Lespedeza thunbergii	598	76	45,448
Lespedeza cyrtobotrya	600	73	43,800
Chaemaecrista fasciculata	562	64	35,968

Bicolor plants on the patches observed dropped their seed from early October through early February. Most of the seed fell in November and early December. On February 1, 1952, only about 5 to 10 percent of the seed was still on the stalks. About one or two percent remained on the stalks on February 19. Bicolor seed is usually ready for combining at Auburn on about November 10, depending on frosts. Frosts on October 29 and 30 in 1952, a year with severe summer drouth, resulted in a yield of "light" seed with poor germination.

Partridge peas apparently shattered seed from late September through most of October. Series E was ready for combining on October 5, 1950.

DISCUSSION

Information indicates that in the patches studied, bicolor is superior to *Lespedeza thunbergii* and *Lespedeza cyrtobotrya* and partridge peas as a year

round dependable food supply. It is also apparent that the lespedezas are slow in getting into production. In fact, the production of partridge peas in their first year is about as good as that of bicolor in its fourth year. After that age, however, bicolor takes the lead and accumulates a surplus which increases each year. Bicolor accordingly provides a sort of "ever normal granary" for the birds, guaranteeing a food supply even if there should be a complete seed crop failure in some years. Mature bicolor stands in the Auburn area have not had a serious seed crop failure in the past four years, even in the face of severe drouths.

Partridge peas have the advantage of quick production but disadvantages of decreasing in production if not disked or burned at least once every two years, limited availability of seed in winter, and small carry over, as the seeds are more apt to sprout or otherwise be lost. They lack some of the dependability shown by bicolor.

Information suggests the possibility of using both bicolor and partridge peas in development programs that seek quick results. In such a case, patches of peas could be used to establish a quick food supply which would last just about long enough to help the birds until the bicolor comes into significant production approximately in its third season, depending on weather conditions and soil fertility. The heavy stands of large partridge peas, which occur in a wild state, in some areas in Alabama preclude any necessity of planting this species.

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