

## ACCEPTABILITY OF HYACINTH BEAN AS FOOD FOR BOBWHITE QUAIL<sup>1</sup>

MARK J. GUDLIN, RALPH W. DIMMICK, AND HENRY A FRIBOURG<sup>2</sup>

### ABSTRACT

Groups of bobwhite quail (*Colinus virginianus*) were fed either commercial game bird chow or the beans of *Lablab purpureus* in both ground and whole form to determine their acceptability as a quail food. Groups fed ground or whole beans consumed fewer beans ( $P < 0.05$ ) and experienced larger weight losses than groups fed commercial chow. Hyacinth beans are apparently not toxic, but are relatively unpalatable to pen-reared bobwhite quail.

### INTRODUCTION

*Lablab purpureus* (hyacinth or lablab bean) is a short-lived perennial tropical legume, well adapted for growth in areas with hot summers, some droughts, and well drained soils. Its potential as a forage crop is recognized in Australia, Brazil and elsewhere (Schaaffhausen, 1963). Hyacinth bean has many advantages over other cultivated legumes. It has a long growing season, grows well at high temperatures and, once established, tolerates long periods of dry weather. Hyacinth bean is indeterminate in flowering habit and is a prolific seed producer. It is killed by frost and is relatively disease free (Schaaffhausen, 1963).

High yield, leafiness and protein content make hyacinth bean attractive as feed for livestock (Cassidy, 1975). Although Schaaffhausen (1963) stated that "cattle consume it readily, even the first time," results of other studies (Cassidy, 1975; Hendricksen and Minson, 1980; Fribourg et al., 1984) indicate that some adaptation by animals is needed. Hyacinth bean also has been used as feed for goats, pigs, and horses (Schaaffhausen, 1963).

The many positive attributes of the plant have stimulated a research effort to determine its potential for use in

western Tennessee, where the humid mesothermal climate is often hot and dry in summer. Initial success in growing hyacinth beans was achieved in Madison County (Fribourg and Overton, 1977). Most recently, hyacinth bean has been used successfully as a pasture crop for creep grazing steers at Ames Plantation in Fayette and Hardeman counties and in Weakley County (Fribourg et al., 1984).

Ames Plantation, in Fayette and Hardeman counties, is intensively managed for bobwhite quail (*Colinus virginianus*); it is the site of the National Field Trial Championships for pointing bird dogs. Any major land management practice instituted at Ames Plantation is evaluated for its impact on bobwhite quail. This study was done to determine if the bean is toxic to bobwhites, and if not, to evaluate its suitability and acceptability as a food resource for the bird.

### MATERIALS AND METHODS

The study was conducted in two independent experiments. The first experiment attempted to determine whether hyacinth beans produce observable toxic effects on bobwhite quail, and the second was designed to evaluate their acceptability as feed by pen-reared or captive quail.

For each experiment, ten pen-reared quail (five males, five females) were utilized. The birds were separated into a control group and an experimental group of five birds each (two males and three females, or vice versa). Each group was placed in one of the upper two levels of a 5-tier Beacon<sup>®</sup> (Westminster, MD) galvanized brooder pen kept in a large room. Daylength was maintained at 12 hours each day. Food and water were provided ad libitum, and food consumption was monitored.

Quail body weights and food consumption were measured to the nearest 0.1g. Birds were weighed in the morning at about the same time on each occasion. Fresh food was supplied at each weighing time. Fresh water was provided and cage floor papers were changed every other day.

*Toxicity evaluation.* The control group of five birds was fed Purina Game Bird Chow<sup>®</sup>, the food on which they had

<sup>1</sup>Contribution from the Tennessee Agricultural Experimental Station, Knoxville, TN, 37901-1071. Partial funding provided by McIntire-Stennis. Rec'd. 1987.

<sup>2</sup>Former graduate student, and Professor, Dept. Forestry, Wildlife and Fisheries; and Professor, Dept. Plant and Soil Science.

been reared prior to the experiment. The experimental group was provided whole hyacinth beans (Tift-1 cultivar). Each bird was weighed at the beginning of the experiment and after 7, 14, 17, and 20 days. Uneaten beans were collected from the papers, rinsed to remove adhering excreta, air dried and weighed.

**Feed acceptability.** As in the first experiment the control group was fed solely Purina Game Bird Chow®. The experimental group was provided with chow the first 3 days. Thereafter, the chow was mixed with increasing (25% by weight) increments of ground hyacinth beans every 3 days until the feed was solely beans ground to a consistency comparable to that of the commercial feed (i.e., % beans in feed was 0, 25, 50, 75, and then 100). Quail and residual food were weighed at 3-day intervals for 24 days.

#### RESULTS AND DISCUSSION

In both experiments, the mean starting weights of the control and experimental groups were not statistically different ( $P > 0.05$ ). Consequently, observed differences in feed consumption and weight changes between groups were attributed to differences in diet.

**Toxicity evaluation.** Average daily feed consumption was greater ( $P < 0.05$ ) in the control group (18.1 g/bird/day) than in the experimental group (7.6 g/bird/day) (Table 1).

Table 1. Bobwhite quail weights and feed consumption when fed game bird chow or whole hyacinth beans.

Feed	Time	Mean feed consumption g/bird/day	Mean body weight g/bird	Mean weight change g/bird/day
<b>Game bird chow:</b>				
	Initial mean weight		205.5	
	Days 1-7	18.7		1.7
	Days 8-14	17.8		1.0
	Days 15-17	17.6		-0.2
	Days 18-20	—		-0.3
	Mean consumption	18.1		
	Final mean weight		223.1 <sup>1</sup>	
<b>Whole hyacinth beans:</b>				
	Initial mean weight		193.0 <sup>1</sup>	
	Days 1-7	7.5		-3.6
	Days 8-14	6.4		-1.6
	Days 15-17	10.8	145.6 <sup>1</sup>	-2.0
	Days 18-20	—		6.4
	Mean consumption	7.6		
	Final mean weight		160.5 <sup>2</sup>	

<sup>1</sup>Mean of 5 birds.

<sup>2</sup>Mean of 3 surviving birds.

Control birds consuming the commercial chow (17.6 g/bird) all gained weight during the 20-day feeding period.

Birds fed hyacinth beans lost an average of 32.5 g/bird during the experimental period. Two birds died during the experiment, after having lost 17% and 29% of their body weight after 16 and 18 days, respectively. Necropsies revealed no gross abnormalities other than emaciation and loss of all subcutaneous body fat. The remaining three experimental birds were switched to commercial chow after the 20th day. They were observed for an additional 8 days, during which time they appeared active and alert, and gained an average of 26 g.

No appreciable amount of chow was observed on the cage floor of the control group, but whole or partial hyacinth beans were scattered on the cage floor housing the experimental birds (69% as much as total beans consumed). When feeding, the experimental birds often would peck at the beans in the food trough, but not pick up any in their beaks. When a bean was picked up, the birds often would take a few steps away from the trough and set the bean down, whereupon the bean would fall through the wire mesh floor and onto the cage floor among the droppings. It is possible that the birds, unaccustomed to eating whole beans, were setting them on the floor in order to use their beaks to break them into smaller pieces. This could not be accomplished on the mesh floor. To eliminate this source of variation in the second experiment, the hyacinth beans were ground to a consistency similar to that of the chow.

Hyacinth beans are reported to cause cyanide poisoning in human beings when the pods and beans are insufficiently boiled prior to their consumption (Hardin and Arena, 1974:64). The toxic agent is a cyanogenic glycoside. The beans, however, appear to be non-toxic to bobwhite quail. The two deaths which occurred in the first experiment apparently were due to loss of weight resulting from decreased food consumption rather than from bean toxicity.

**Feed acceptability.** Average daily consumption of chow by the experimental group was inversely proportional to the percentage of beans in the feed ( $r=0.93$ ) (Table 2). Consumption by the control group varied somewhat ( $s=2.5$  g/bird/day) but there was no significant change from beginning to end of the 24-day feeding period. The experimental group consumed 14% more food than the control group until the percentage of beans in the feed reached 75%. Consumption declined dramatically after that point.

Net weight change of the control birds was slight, averaging a loss of 3.8 g/bird (1.6% of mean starting body weights). Net weight change of experimental birds was significantly larger ( $P < 0.05$ ), with a mean loss of 69.3 g/bird (28% of mean starting body weight). Coinciding with the drop in food consumption, decrease in body weight was also greatest after the percentage of beans in

the feed reached 75%. No quail died, though some birds experienced weight losses as great as 43%. This experiment was terminated when the drastic loss of body weight endangered the life of the birds. The experimental quail were switched to a chow diet and observed for one week. No mortality occurred, and the birds appeared alert and active.

Daily consumption of commercial chow was slightly higher than that reported by Robel et al. (1979) for corn and sorghum, both of which they determined provided palatable and energy efficient diets for bobwhite quail. Consumption of hyacinth beans was comparable to rates reported by the same authors for switchgrass (*Panicum virgatum*) and red oak (*Quercus rubra*) acorns, both considered poor quail foods.

Table 2. Bobwhite quail weights and feed consumption when fed game bird chow or increasing quantities of ground hyacinth bean.

Feed		Time	Mean feed consumption	Mean body weight	Mean weight change
Game bird chow	Ground hyacinth bean				
%	%		g/bird/day	g/bird	g/bird/day
<b>Control group:</b>					
-	-	Day 0		237.9	
100	0	Days 1-3	13.6 <sup>1</sup>		-0.9
100	0	Days 4-6	19.7		1.3
100	0	Days 7-9	15.3		-1.4
100	0	Days 10-12	17.6		-0.9
100	0	Days 13-15	19.6		2.3
100	0	Days 16-18	14.0		-0.3
100	0	Days 19-21	18.9		0.3
100	0	Days 22-24	18.1		-1.4
		Day 24		234.1	
<b>Experimental group:</b>					
-	-	Day 0		247.4	
100	0	Days 1-3	18.3		-1.8
75	25	Days 4-6	20.1		-0.2
50	50	Days 7-9	18.0		-1.8
25	75	Days 10-12	13.9		-3.5
0	100	Days 13-15	10.1		-1.9
0	100	Days 16-18	10.0		-1.4
0	100	Days 19-21	9.2		-5.7
0	100	Days 22-24	10.9		-7.1
		Day 24		178.1	

<sup>1</sup> Mean of 5 birds

## CONCLUSIONS

Consumption of hyacinth beans by quail was low in both experiments, although the birds consumed slightly more ground beans than whole beans. Size of feed particles and method of presentation may have had some effect on consumption rates. In the toxicity experiment, the experimental birds were switched suddenly from their accustomed food type (commercial chow) to a new food with much larger size. Mean consumption while on a 100% whole hyacinth bean diet was 7.6 g/bird/day. In the feed consumption experiment, the experimental group was introduced gradually to hyacinth beans ground to a feed consistency to which they were accustomed; the consumption rate while on a 100% ground hyacinth bean diet was 10.1 g/bird/day. Nonetheless, consumption of hyacinth beans in either form was considerably less than that of chow, and weight losses were too high for long term feeding of this seed as the sole diet. Its apparent lack of toxicity, however, suggests that it may serve as a portion of the bobwhite's diet without causing harm.

## LITERATURE CITED

- Cassidy, G.J. 1975. Lablab bean for autumn grazing. *Queensland Agric. J.* Jan.-Feb. 1975:37-40
- Fribourg, H.A., and J.R. Overton. 1977. Forage and seed production of *Dolichos lablab* in Tennessee. Progress Report—Clovers and Special Purpose Legumes Research 10:31.
- Fribourg, H.A., J.R. Overton, W.W. McNeill, E.W. Culvahouse, M.J. Montgomery, M. Smith, R.J. Carlisle, and N.W. Robinson. 1984. Evaluations of the potential of hyacinth bean as an annual warm-season forage in the mid-south. *Agron. J.* 76:905-910.
- Hardin, J.W., and J.M. Arena. 1974. *Human poisoning from native and cultivated plants*. Duke University Press, Durham, NC. 167 pp.
- Hendricksen, R., and D.J. Minson. 1980. The feed intake and grazing behaviour of cattle grazing a crop of *Lablab purpureus* cv. Rongai. *J. Agric. Sci., Camb.* 95:547-554.
- Robel, R.J., A.R. Bisset, A.D. Dayton, and K.E. Kemp. 1979. Comparative energetics of bobwhites on six different foods. *J. Wildl. Manage.* 43(4):987-992.
- Schaaffhausen, R.V. 1963. *Dolichos lablab* or hyacinth bean: Its uses for feed, food and soil improvement. *Econ. Botany* 17:146-153.