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STUDIES ON THE FEEDING VALUE OF THE *LESPEDEZA* I. CHEMICAL COMPONENTS AND TANNINE CONTENTS

By

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To increase domestic animal population, the production of the coarse fodder especially roughage in large amount is essential. The farmers in Japan, however, have little knowledge about this fact, and they feed their animals only by their farming by-products. They do not think about using weeds and grasses from uncultivated grassland, although the vast area of grassland everywhere in Japan, could serve for ample supply of coarse fodder. Improvement of the vegetation of the grassland would increase the live-stock industry of Japan. *Lespedeza*[1)2)] is one of the most popular and widely distributed plants in Japan. The plant has not only strong resistance to drought, winter killings, insect injuries and many dseasses, but also has favourable adaptability to extremely bad soil conditions. As a leguminous plant, *Lespedeza* must have high nutritive value in its composition. Animals, however, dislike the plant because of its high tannine content.

There are about 54 species of *Lespedeza* known, but, comparative studies among these species with concern to their feeding results have not been performed.

It would be interesting and economically important to find the most adequate species of *Lespedeza* as fodder, and, if possible, to breed a new species for this purpose.

First of all, the thannine contents and the chemical components of several *Lespedeza* were investigated.

Materials and Methods

Eight species of *Lespedeza*, which grow wild in district of Sendai, Japan, are taken as samples, i. e.

1. *Lespedeza Buergeri Miq.*
2. *L. cyrtobotrya Miq.*
3. *L. serpens Nakai*
4. *L. pilosa Sieb et Zucc*
5. *L. japonica Bailey var. albiflora Nakai*
6. *L. sericea Miq.*
7. *L. bicolor Turcz var. japonica Nakai*
8. *L. Sieboldi Miq.*

The branches of the plants, recognized from their environment and degree of growth to be of about the same condition, were identified and selected for study. Their leaves within 20 cm from the branch points were collected at 11-12 o'clock, a. m., and their water contents were mersured as soon as possible. Then after the samples are left in room temperature for 24 hours, dried at 40°C for 2 days and then powdered.

The chemical component —— water, crude protein, crude fat, N-free extract, cruder fiber, ash —— was analysed according to the usual method in two different conditions of the plants, before and after the flowering stages.

The tannine content was analysed according to Migita's method[3] in three different conditions, i. e. the flowering stage of the plants was considered, adding the two other conditions mentioned above. First, each sample was completely distilled water, and 3 cc of 2% CH_3COOH solution was added in 10 cc of its water extarct. Then 50 cc of 1% K_2CrO_4 solution was added, heating on a hot water bath. It was left in room temperature after being boiled about 30 minutes. The filtered precipitate was washed with hot water until CrO_4" melted away thoroughly, and then was quantified, and the gained amount was multiplied by 0.5 to obtain the tannic acid content.

Results

a) *The Chemical Components.*[4]

Chemical components of the plant before the flowering stage are shown in Table 1.

The crude proteins are found generally in large amounts, especially in *Les. cyrtobotrya, Les japonica Bailey var. albiflora Nakai,* and *Les. bicolor Turcz var. japonica Nakai* exceeded 20%. The crude fibers were generally about 20%, but *Les. Sieboldi Miq.* and *Les. cyrtobotrya* were less than the others, being 17.05%, and 16.98%, respectively. Almost no differences was recognized in the components of crude fats.

As compared with the chemical components of the plants between before and after the flowering stages (Table 1 and 2), generally the curde proteins

decrease, but *Les. cyrtobotrya Miq.* exceeded 20 % similarly extending over both stages, and *Les. japonica Bailey var. albiflora Nakai* shows 19.61 %. The crude fats and ashes as well as the crude fiber somewhat tend to increase.

Concerning the N-free extract, *Les. Sieboldi Miq.* had the largest amount, showing about 50 % in both stages.

Table I. Chemical Components Before the Flowering Stage (in the middle of July).

Lespedeza	Water	Organic matter	Crude protein	Crude fat	Carbohydrate		Ash
					N-free extract	Crude fiber	
1	10.37%	84.45%	11.89%	3.61%	45.63%	23.32%	5.18%
2	8.34	84.87	21.95	3.80	42.13	16.98	6.79
3	7.49	87.42	16.83	3.57	47.53	19.49	5.09
4	10.60	84.74	17.67	3.93	41.71	21.43	4.66
5	7.99	85.54	21.30	3.85	39.90	20.49	6.47
6	8.67	86.20	16.83	3.18	46.81	19.38	5.13
7	8.30	85.90	21.20	3.61	41.56	19.53	5.80
8	11.28	84.38	11.56	4.10	49.67	17.05	6.34

Table II. Chemical Components after the Flowering Stage (in the last of September).

Lespedeza	Water	Organic matter	Crude protein	Crude fat	Carbohydrate		Ash
					N-free extract	Crude fiber	
1	7.76%	86.62%	11.71%	6.88%	43.70%	24.33%	5.62%
2	7.43	84.92	20.98	5.48	41.02	17.44	7.65
3	5.70	90.02	16.11	4.22	49.32	20.37	4.28
4	7.26	85.97	17.06	6.04	41.43	21.44	6.77
5	7.16	85.12	19.61	5.53	38.62	21.36	7.72
6	5.65	89.17	16.23	6.34	46.77	19.83	5.18
7	7.90	85,12	15.37	6.77	43,21	19.77	6.98
8	8.16	84.83	11.49	4.86	50.30	18.18	7.01

From the above results regarding the chemical components, *Les. cyrtobotrya Miq.* is the best feed, and *Les. japonico Bailey var. albilora Nakai* and *Les. bicolor Turcz var. japonica Nakai* are next in rank.

b) *Tannine Contents.*

The tannine contents of the plants before the flowering stages are between 3.7 % and 17.1 %. *Les. Sieboldi Miq.* and *Les. japonica Bailey var. albiflora Nakai* have much tannine, i. e. 16.4 %: and 17.1 %, respectively. *Les. Buergeri Miq.* and *Les. cyrtobotrya* have less, i. e. 3.7 % and 4.1 %, respectively. During the flowering stage they are between 2.9 % and 12.1 %. *Les. Sieboldi Miq.* and *Les. japonica Bailey var. albiflora* have large amounts. After the flowering stages they are between 2.7 % and 7.6 %. *Les. sericea Miq.* and *Les. pilosa*

Sieb et Zucc have large amounts, i. e. 7.6 % and 6.1 %, respectively. *Les. Buerger Miq.* and *Les. cyrtobotrya* have small amounts.

Generally, the tannine contents of *Lespedea* differ according to the stages of growth. The tannine content is greatest before the flowering stage, next during the flowering stage, and least after the flowering stage. Among eight species, Les Sieboldi Miq. and *Les. japonica Bailey var. albiflora Nakai* have much tannine and *Les. Buergeri Miq.* and *Les. cyrtobotrya* have less, as shown in Table 3.

Table III. Tannine Contents.

Lespedeza	Before the flowering stage		During the flowering stage		After the flowering stage		Remarks
	Crude tannine	Water	Crude tannine	Water	Crude tannine	Water	
1	3.7%	68.1%	2.9%	65.8%	2.7%	63.4%	% in row leaves
2	4.1	72.5	3.3	72.2	2.9	59.6	
3	6.2	69.4	3.9	62.7	3.1	61.2	
4	12.6	72.6	7.1	72.3	6.1	54.2	
5	17.1	74.1	10.5	70.9	5.2	63.1	
6	8.8	68.3	8.6	58.7	7.6	55.4	
7	9.2	65.8	8.4	63.5	5.7	61.8	
8	16.4	69.3	10.1	66.9	4.8	61.2	

Summary

1. This study was performed to find the most adequate species as fodder among the *Lespedeza*. First, the chemical components and tannine contents were measured.

2. The tannine content concerns the palatability of the animal.

3. Regarding the chemical components, *Les. cyrtobotrya* is the best feed, *Les. japonica Bailey var. albiflora Nakai* and *Les. bicolor Turcz var. japonica Nakai* are next in rank.

4. The tannine content was the greatest before the flowering stage, next during the flowering stage, and least after the flowering stage.

5. Among eight species, *Les. japonica Bailey var. albiflora Nakai* and *Les. Seiboldi Miq.* have much tannine and *Les. Buregeri Miq.* and *Les. cyrtobotrya Miq.* have less.

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