Studies on the Food Habits of Rats IV. Effects of a Scent Rice on Bait Acceptance by Two Species of Commensal Rats.

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16. ネズミの食性に関する研究 IV. イエネズミの食物摂取におよぼすニオイ米の効果

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ドブネズミおよびクマネズミのニオイ米（品種：ヒエリ）ならびに一般米（ササニシキ）に対する嗜好性を知るため，同腹の動物群を用いて室内試験をおこなった．ニオイ米はドブネズミに好まれ，適量のニオイ米の添加は雑穀基材の餌の摂取性を高めた．一般米は両種のネズミに摂取されたが，その嗜好性はやや低かった．

Scent rice, also called rat rice or sweet rice, has been little known to the general public but it began to be used in Japan about 400 years ago. This rice is usually cooked with ordinary rice, and it is seldom that the rice is to cooked alone. The scent rice has long been used as a food additive. When a small amount of scent rice and an old rice boiled together, the old rice is turned into tasty as good as a new rice. There are several varieties of scent rice in Japan and they have a smell of rat's urine or sweet smell with few exceptions. The scent rice is chiefly cultivated in the mountain villages of approximately 250m above the sea-level. As the harvest time is coming near, a faint smell of the rice hangs in the air. Then, the half-ripe grains are being attacked by many of the indigenous rodents[2,4]. It is also said that the scent rice is attacked by rodents not only in rice-fields but in the form of grain in store[3].

In this paper, the authors report the preference of two commensal rats, Norway rats and roof rats, for a scent rice in comparison with an ordinary rice under laboratory conditions. The results show that scent rice was preferred by Norway rats when it was used as a bait with lower proportions of scent rice in the bait mixtures. Roof rats took the reasonable amount of scent rice, while they preferred ordinary rice to scent rice when both varieties of rice were readily available.

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Materials and Method

The animals used were both laboratory colonies of Norway rats, *Rattus norvegicus* and roof rats, *Rattus rattus* which had been reared in the laboratory. In advance of the tests, the infant animals from th esame litter were separated from their mother and confined in a breeding cage every group.

The test baits used were two varieties of rice, Hieri and Sasanishiki. Hieri is a variety of scent rice as mentioned above, and it is usually used as a food additive. Sasanishiki is an ordinary rice which has been popularly consumed by Japanese people. Both varieties of rice were offered in the unmilled grain, coarsely ground and finely powdered forms.

The test cage is consisted of stainless wire-netting, 26cm×30cm and 17cm in height, with a netted door in the side wall. Bait container is consisted of glass dish, 7cm in diameter and 4.5cm in height.

A test rat was confined in a cage individually and allowed to choose a paired baits for 24 hours. Two dishes with the greater amount of test baits were placed to either corner of the cage at the same time. The baits were renewed and their positions were changed every day to eliminate prejudice due to place preference.

Table 1. Comparison of the daily consumption of two varieties of rice grains by commensal rats. Average of two replications.

Test bait Standard rice* plus:	Consumption/100g body w./day			n	Chi-square Significance p=0.05	Average of body weight (no. of mouse)
	Test bait	Standard rice*	Total taken			
	Rattus norvegicus					
Hieri 100%	1.9	7.4	9.3	16	*	208(4)
50	5.6	3.4	9.0	16	N.S.	204(4)
25	2.6	6.4	9.0	16	N.S.	176(4)
Hieri only	6.2	nil	6.2	16		309(4)
Standard only	nil	6.9	6.9	16		309(4)
	Rattus rattus					
Hieri 100%	0.8	8.1	8.9	16	*	132(4)
50	3.6	5.3	8.9	16	*	138(4)
25	2.5	6.2	8.7	16	*	133(4)
Hieri only	8.0	nil	8.0	16		98(4)
Standard only	nil	10.0	10.0	16		98(4)

* Sasanishiki used as a standard rice.

Table 2. Comparison of the daily consumption of two varieties of ground rice by commensal rats. Average of two replications.

Test bait Standard rice* plus:	Consumption/100g body w./day			n	Chi-square Significance p=0.05	Average of body weight (no. of rats)
	Test bait	Standard rice*	Total taken			
	Rattus norvegicus					
Hieri 100%	2.2	5.9	8.1	16	*	208(4)
50	4.4	3.2	7.6	16	N.S.	214(4)
25	4.4	4.8	9.2	16	N.S.	176(4)
	Rattus rattus					
Hieri 100%	1.1	6.2	7.3	16	*	132(4)
50	2.8	5.7	8.5	16	*	138(4)
25	1.7	6.3	8.0	16	*	133(4)

* Sasanishiki used as a standard rice.

Results and Discussion

Each test group was consisted of four adult rats of equal sex ratio. Average daily consumption of the baits was calculated and indicated per 100g body weight of test rat.

Tables 1 and 2 show the preferences of two commensal rats for two varieties of rice in the forms of ground and whole grain. There were some differences in the daily consumption of Norway rats between Hieri and Sasanishiki. In a higher proportion of scent rice, Norway rats preferred ordinary rice rather than scent rice. Adult roof rats preferred Sasanishiki to Hieri when both varieties of rice were readily available, while the reasonable amount of Hieri was consumed when Sasanishiki was absent. It is a characteristic evidence that young roof rats less than 90g of body weight were chosen Hieri even though Sasanishiki was available.

The results of the preferences of two commensal rats for the test baits consisted of various proportions of powered rice and wheat flour are given in Tables 3 and 4. At low proportion of Hieri in the bait mixture did not distinguish by both species of rats so that the test bait and wheat flour were taken about equally.

The proper quantity of scent rice may be a bait enhances for Norway rats. Table 3 shows the addition of 5 to 20% of Hieri to the bait mixtures increased the intake of the baits, and there was about two-fold improvement in consumption of the test baits. No significant differences were observed in all mixed baits with Sasanishiki.

It has already been recognized that all varieties of rice include certain volatile carbonyl compounds, and the quantity of these compounds included in scent rice is more than that in ordinary rice. Especially, scent rice includes much more acetaldehyde, n-valeraldehyde, n-caproaldehyde[1] free fatty acids and ash than ordinary-rice[5].

The preference for scent rice may be due to certain compounds which is included in this rice, but there is no connection between the quality or the strength of these compounds and the effectiveness of attraction to rats. In addition,

Table 3. The relative consumption of the bait mixtures by Norway rat, *R. norvegicus* in an individual test during two and three day periods.

Test bait Wheat flour plus:	Consumption/100g body w./day			n	Chi-square Significance p=0.05	Average of body weight (no. of mouse)
	Test bait	Wheat flour	Total taken			
Hieri 0.5%	2.8	2.9	5.7	24	N.S.	201(4)
1.0	3.1	2.6	5.7	24	N.S.	211(4)
5.0	5.3	2.6	7.9	24	*	177(4)
10.0	3.5	1.8	5.3	24	*	282(4)
20.0	3.7	2.2	5.9	24	*	234(4)
Sasa* 0.5%	2.8	2.2	5.0	16	N.S.	201(4)
1.0	2.3	2.6	4.9	16	N.S.	211(4)
5.0	4.8	1.7	6.5	16	*	177(4)
10.0	2.8	2.5	5.3	16	N.S.	298(4)
20.0	3.3	3.1	6.4	16	N.S.	234(4)

* Sasanishiki used as a standard rice.

Table 4. The relative consumption of the bait mixtures by roof rat, *R. rattus* in an individual test during two and three day periods.

Test bait Wheat flour plus:	Consumption/100g body w./day			n	Chi-square Significance p=0.05	Average of body weight (no. of mouse)
	Test bait	Wheat flour	Total taken			
Hieri 0.5%	3.1	4.0	7.1	24	N. S.	128(4)
1.0	3.0	3.6	6.6	24	N. S.	134(4)
5.0	2.4	3.6	6.0	24	*	129(4)
10.0	1.9	2.5	4.4	24	N. S.	129(4)
20.0	3.5	3.7	7.2	24	N. S.	136(4)
Sasa* 0.5%	3.6	2.6	6.2	16	N. S.	128(4)
1.0	2.1	2.5	4.6	16	N. S.	134(4)
5.0	2.6	2.8	5.4	16	N. S.	128(4)
10.0	3.3	3.8	7.1	16	N. S.	78(4)
20.0	3.3	4.4	7.7	16	N. S.	81(4)

* Sasanishiki used as a standard rice.

scent rice is attacked by many of indigenous rodents, whereas the species which is responsible for most of the damage in rice-fields or storehouse is unknown.

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Summary

To know the preferences of Norway rats, *Rattus norvegicus*, and roof rats, *R. rattus* for a scent rice (Hieri) and an ordinary rice (Sasanishiki), laboratory tests were carried out by using the groups of animals from the same litter.

The results showed that scent rice was accepted by Norway rats. The addition of proper quantity of scent rice to the bait mixtures increased the intake of the baits. Ordinary rice was accepted by both species of rats, but this rice was preferred somewhat less.

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