

アワビ,ドジョウ並びにブリに対するL-ジペプチドの摂餌誘引活性

誌名	日本水産学会誌
ISSN	00215392
著者	原田, 勝彦
巻/号	55巻9号
掲載ページ	p. 1629-1634
発行年月	1989年9月

Feeding Attraction Activities of L-Dipeptides for Abalone, Oriental Weatherfish and Yellowtail*¹

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(Received April 12, 1989)

The attraction activities for three species of test animals, abalone *Haliotis discus*, oriental weatherfish *Misgurnus anguillicaudatus* and yellowtail *Seriola quinqueradiata* were behaviorally and statistically investigated mainly of L- and antero-dipeptides composed of a neutral amino acid, glycine and one of the basic L- ones, arginine, histidine and lysine at N-terminal. In a comparison test between two kinds of D- and L-dipeptides, and antero- and retro-ones having respectively N-terminal histidine and C-terminal histidine, the activities of L- and retro-types were respectively appreciably higher than those of the D- and antero-types. Among thirty-three specimens of L-dipeptides tested, only glycylalanine was a common attractant for all three test animals, while arginylalanine, alanylhistidine, valyllysine and other 4 peptides were attractants for two species, and glycylaspartic acid and other 11 peptides were effective for one species. The attraction activity of dipeptides depended on the species of test animals. In comparison between the activities of dipeptides and those of their constituent amino acids, some dipeptides showed apparent synergistic effect in highest degree for both abalone and oriental weatherfish, but the effectiveness of all the attractive peptides for the yellowtail was less than additive.

In a series of studies on the feeding attractants for the three aquatic animals of young black abalone *Haliotis discus*, adult oriental weatherfish *Misgurnus anguillicaudatus* and juvenile yellowtail *Seriola quinqueradiata*, it has been verified that the attraction activity of combinations of certain amino acids is considerably higher than that of each amino acid.¹⁾ This finding suggests the possibility that a peptide may be also effective in the attraction behavior. It has so far found in only a few reports that the peptides or the peptide-like compounds are feeding attractants or activators for some aquatic animals; glutathione for a kind of coelentrata *Hydra littoralis*,²⁾ oligopeptide for red sea bream *Chrysophrys major* and black porgy *Acanthopagrus schlegeli*,³⁾ and arcamine (hypotauryl-2-carboxyglycine) and strombine (C-methyl-imino diacetic acid) for grunt *Bathystoma rimator*.³⁾ Similarly certain di- or tripeptides are also electrophysiologically ascertained to be stimulatory for the olfactory chemoreceptors of the rainbow trout *Salmo gairdneri*.⁴⁾

In contrast, some peptides are inactive or neutral in the exploratory and feeding behavior; γ -

glutamylcysteine, cysteinylglycine, glycylcysteine and asparthion (β -aspartylcysteinylglycine) for the *Hydra*,²⁾ and glycyl- and alanyldipeptides for the red sea bream.⁵⁾ These studies sporadically deal with the effect of only a few limited peptides as described above.

The aim of the present study is to systematically investigate the attraction activities of dipeptides composed of glycine or basic amino acids for the three test animals, abalone, oriental weatherfish and yellowtail. The reason why the specific dipeptides were tested in this experiment is that the component amino acids of these peptides are potent attractants for the test animals.⁶⁻⁸⁾

Materials and Methods

Test Animals

Source and maintaining of the above three test animals are described in a previous paper.¹⁾ Brief comments are provided here on the initial representative body size of the test animals. The sizes were 2.2 cm in shell length for abalone, 11.8 cm in body length for oriental weatherfish

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*³ J. Kawai, O. Yano, and K. Kubota; *Japan Kokai Tokyo Koho JP 55277-84(8027784)* (C1.A23/K1/18), 23 July 1980, Appl. 77/38565, 06 April 1977, pp. 1-3.

and 5.3 cm in fork length for yellowtail.

Authentic Amino Acids and Dipeptides

Twenty-one amino acids, thirty-three dipeptides and one tripeptide used were listed in Tables 1-5. Of the 21 amino acids, 16 were neutral and amide, 3 were basic and 2 were acidic amino acids. Furthermore, the thirty-three dipeptides included 14 specimens of Gly containing L-dipeptides, 2 Gly containing D-dipeptides, 8 His containing L-dipeptides, 7 Arg containing L-dipeptides and 2 Lys containing L-dipeptides. The tripeptide used was Gly-Gly-Gly.

The concentrations used were 2.0, 7.5 and 22.5 mM for abalone, oriental weatherfish, and yellowtail, respectively. Each solution was adjusted to pH 6.5 by addition of dilute solution of sodium hydroxide or hydrochloric acid.

Estimation of Attraction Activities by Attraction Indexes

Estimation of attraction indexes *a* and *gr* for abalone and oriental weatherfish, and yellowtail has been previously reported.⁹⁻¹¹⁾ Briefly the estimation of *a* and *gr* was done by applying the remaining and the entering or leaving time-courses in the behavioral experiment to a logistic curve $y=g/[1+\exp[-r(j-a)]]$, respectively. Crumpled ball gauze absorbing 7.5 ml of test solution was used as attractant sample in the behavioral experiment for estimating the index *a* or *gr*.

Results

Attraction Activities of Gly Containing Isomer-Dipeptides

The attraction index *a* or *gr* of isomer-dipeptides and of their constituent amino acids was shown in Table 1 for three test animals. In comparison of the index *a* or *gr* of L- and D-dipeptides for the three species of animals (Nos. 1-4), the attraction activities of the formers were obviously higher than those of the latters. The result indicates the possibility that L-dipeptides may be most effective in the attraction behavior. This was clarified by a comparative test of Gly-L-Asn and Gly-D-Asn (No. 5).

Attraction Activities of Gly Containing L-Dipeptides

The attraction index *a* or *gr* of Gly containing L-dipeptides and of their constituent amino acids was collectively given in Table 2. Among twelve glycyldipeptides tested, only Gly-Ala (No. 6) was appreciably higher in the attraction activity *a* or

Table 1. Attraction activities of Gly containing isomer-dipeptides for three species of animals

No.	Dipeptides	Attraction activities*		
		A	O	Y
1	Dummy	—	—	44.6 [†]
	Gly	6.0 [†]	0.8 [†]	46.9 [†]
	L-Asn	12.7 [†]	2.0 [†]	48.5 [†]
	Gly-L-Asn	7.5 [†]	2.6 [†]	52.9 [†]
2	Dummy	—	0.1 [†]	54.9 [†]
	Gly	7.1 [†]	1.8 [†]	131.5 [†]
	D-Asn	4.4 [†]	1.6 [†]	70.4 [†]
	Gly-D-Asn	2.7 [†]	1.8 [†]	89.4 [†]
3	Dummy	2.7 [†]	4.0 [†]	61.1 [†]
	Gly	3.9 [†]	6.5 [†]	124.6 [†]
	L-Val	4.0 [†]	2.7 [†]	84.4 [†]
	Gly-L-Val	7.4 [†]	5.0 ^{†?}	86.7 ^{†?}
4	Dummy	3.9 [†]	0.7 [†]	32.0 [†]
	Gly	4.9 [†]	2.4 [†]	35.2 [†]
	D-Val	4.0 [†]	0.9 [†]	27.9 [†]
	Gly-D-Val	4.9 [†]	1.7 [†]	28.2 [†]
5	Dummy	2.9 ^{†?}	—	72.3 [†]
	Gly	7.2 [†]	1.4 [†]	76.4 [†]
	Gly-L-Asn	22.9 ^{†?}	2.0 [†]	94.1 [†]
	Gly-D-Asn	12.4 [†]	1.1 [†]	44.2 [†]

*: The *a* and the *gr* of attraction indexes are derived from a logistic curve $y=g/[1+\exp[-r(j-a)]]$ being applied to remaining and entering or leaving time-courses for abalone (A for short) and oriental wetherfish (O), and yellowtail (Y), respectively.

†, †?, no dagger and —; Pr ($\chi^2 > \chi^2_{0.100}$) > 0.100, slightly less than Pr = 0.100, Pr < 0.100 and not estimated, respectively.

gr than that of the two constituent amino acids in all the three species of animals. In such an attraction evaluation, the attraction activities of dipeptides depended on the species of animals and the potent dipeptides having higher attraction activities than those of their constituent amino acids were Gly-Asp (No. 7) and Gly-Thr (No. 14) for the yellowtail, Gly-Sar (No. 12) for the oriental weatherfish, Gly-Ser (No. 13) and Gly-Gly (No. 17) for the abalone and Gly-Phe (No. 10) for the abalone and oriental weatherfish. Also Gly-Gly-Gly (No. 17) was more effective in the attraction activity than Gly-Gly in the abalone. Although the indexes of Gly-Gly-Gly-Gly, Gly-Gly-Gly-Gly and Gly-Gly-Gly-Gly-Gly were not presented in Table 2, their values were ascertained to increase in order of increasing Gly for only abalone in a separate experiment.

Table 2. Attraction activities of Gly containing L-dipeptides for three species of animals

No.	Dipeptides	Attraction activities		
		A	O	Y
		(a)	(a)	(gr)
6	Dummy	—	—	71.1 [†]
	Gly	7.4 [†]	1.0 [†]	107.8 [†]
	Ala	4.7 [†]	0.7 [†]	103.0 [†]
	Gly-Ala	8.4 [†]	1.7 [†]	129.0 [†]
7	Dummy	4.6 [†]	0.8 [†]	26.6 [†]
	Gly	—	2.1 [†]	40.4 [†]
	Asp	4.7 [†]	0.5 [†]	6.7 [†]
	Gly-Asp	6.3 [†]	0.9 [†]	48.6 [†]
8	Dummy	3.0 [†]	—	41.3 [†]
	Gly	5.3 [†]	1.7 [†]	59.7 [†]
	Ile	3.1 [†]	1.0 [†]	53.7 [†]
	Gly-Ile	4.9 [†]	1.1 [†]	43.6 [†]
9	Dummy	6.0 [†]	1.1 [†]	26.6 [†]
	Gly	6.8 [†]	2.6 [†]	79.8 ^{†?}
	Leu	8.3 [†]	1.5 [†]	78.2 [†]
	Gly-Leu	6.5 ^{†?}	2.1 [†]	68.5
10	Dummy	—	0.7 [†]	—
	Gly	4.3	1.3 [†]	74.3 [†]
	Phe	4.0 [†]	0.6 [†]	41.0 ^{†?}
	Gly-Phe	6.0 [†]	3.8 [†]	55.5 [†]
11	Dummy	—	1.4 [†]	—
	Gly	5.3 [†]	4.7 [†]	114.9 [†]
	Pro	3.6 [†]	2.0 [†]	51.1 ^{†?}
	Gly-Pro	3.7 [†]	1.6 [†]	39.8 [†]
12	Dummy	5.1 [†]	—	84.4
	Gly	13.7 [†]	1.4 [†]	148.4 [†]
	Sar	8.8 [†]	0.9 [†]	121.5 ^{†?}
	Gly-Sar	2.5 ^{†?}	1.7 [†]	133.7 [†]
13	Dummy	—	0.6 [†]	84.1 [†]
	Gly	5.9 [†]	2.1 [†]	158.5 [†]
	Ser	5.3 [†]	1.3 [†]	122.5 [†]
	Gly-Ser	8.5 [†]	1.9 ^{†?}	177.0 [†]
14	Dummy	3.7 [†]	0.5 [†]	101.7 [†]
	Gly	5.5 ^{†?}	1.9 [†]	112.6 [†]
	Thr	5.2 [†]	—	76.0 [†]
	Gly-Thr	4.6 [†]	0.9 [†]	166.0 [†]
15	Dummy	6.0 [†]	1.8 [†]	—
	Gly	11.4 [†]	2.0 [†]	77.5 [†]
	Trp	4.5 [†]	0.6 [†]	44.5 [†]
	Gly-Trp	4.9 [†]	1.9 [†]	17.9 ^{†?}
16	Dummy	5.8 [†]	0.9 [†]	64.6 [†]
	Gly	8.9 [†]	2.3 [†]	104.0 [†]
	Tyr	7.9 [†]	—	47.2 [†]
	Gly-Tyr	6.3 [†]	1.2 [†]	84.8 [†]
17	Dummy	3.2 [†]	—	—
	Gly	5.3 [†]	2.4 [†]	54.4 [†]
	Gly-Gly	13.0 [†]	1.8 [†]	49.6 [†]
	Gly-Gly-Gly	20.0 [†]	1.3 [†]	50.7 [†]

Signs and abbreviations; Legend as Table 1.

Attraction Activities of Basic Amino Acid Containing L-Dipeptides

The attraction index *a* or *gr* of L-Arg, L-His and L-Lys containing L-dipeptides and their constituent amino acids for the three test animals was shown in Tables 3, 4 and 5, respectively.

Of the seven specimens of arginyldipeptides in Table 3, the attractive dipeptides were Arg-Ala (No. 18) for oriental weatherfish and yellowtail, Arg-Asp (No. 19) for abalone and oriental weatherfish, Arg-Glu (No. 20) for abalone and yellowtail, Arg-Leu (No. 22) for abalone, Arg-Phe (No. 23) for oriental weatherfish, and Arg-Val (No. 24) for abalone. Especially many arginyldipeptides were potent attractants for only abalone among the three test animals used.

Of the eight specimens of L-His containing L-

Table 3. Attraction activities of L-Arg containing L-dipeptides for three species of animals

No.	Dipeptides	Attraction activities		
		A	O	Y
		(a)	(a)	(gr)
18	Dummy	5.8 [†]	—	—
	Arg	10.1 [†]	4.7 [†]	118.4 [†]
	Ala	5.1 [†]	1.7 [†]	108.1 [†]
	Arg-Ala	8.6 [†]	7.3 [†]	167.1 [†]
19	Dummy	4.8 [†]	1.1 [†]	118.9 [†]
	Arg	8.5 [†]	3.9 [†]	130.0
	Asp	4.7 [†]	2.1 ^{†?}	99.2 [†]
	Arg-Asp	10.1 [†]	7.0 [†]	130.8 [†]
20	Dummy	5.2 ^{†?}	1.6 [†]	79.4 [†]
	Arg	9.7 [†]	3.3 [†]	141.3 [†]
	Glu	4.8 ^{†?}	1.8 [†]	124.5 [†]
	Arg-Glu	14.4 ^{†?}	3.2 [†]	154.7 [†]
21	Dummy	—	3.6 [†]	—
	Arg	11.1 [†]	4.5 [†]	126.5 [†]
	Ile	9.9 ^{†?}	2.8 [†]	118.7 [†]
	Arg-Ile	3.5 [†]	4.5 [†]	95.6 [†]
22	Dummy	3.3 [†]	—	65.8 [†]
	Arg	7.4 [†]	3.5 [†]	121.1 [†]
	Leu	12.5 [†]	0.5 ^{†?}	68.7 [†]
	Arg-Leu	15.7 [†]	3.1 [†]	103.0 [†]
23	Dummy	4.7 ^{†?}	—	120.7 [†]
	Arg	6.7 [†]	3.9 [†]	203.1 [†]
	Phe	6.4 [†]	1.9 ^{†?}	120.7 [†]
	Arg-Phe	4.7 [†]	4.4 [†]	192.9 [†]
24	Dummy	5.1 [†]	2.9 [†]	67.0 [†]
	Arg	6.5 [†]	4.2 [†]	201.7 [†]
	Val	5.2 [†]	1.6 [†]	137.2 [†]
	Arg-Val	11.7 [†]	2.0 [†]	189.4 [†]

Signs and abbreviations; Legend as Table 1.

Table 4. Attraction activities of L-His containing L-dipeptides for three species of animals

No.	Dipeptides	Attraction activities		
		A	O	Y
		(a)	(a)	(gr)
25	Dummy	5.0 [†]	1.1 [†]	—
	His	6.3 [†]	2.8 [†]	92.6 [†]
	Ala	5.3 [†]	—	47.1 [†]
	His-Ala* ¹	5.3 ^{†?}	1.8 [†]	79.3 [†]
26	Dummy	—	0.0 [†]	—
	His	7.3 [†]	1.7 [†]	150.4 [†]
	Ala	7.0 [†]	1.4 [†]	76.3 [†]
	Ala-His* ²	12.7 ^{†?}	1.9 [†]	143.6 [†]
27	Dummy	7.7 ^{†?}	1.5 [†]	116.7 [†]
	His	8.9 ^{†?}	3.7 [†]	134.1 [†]
	His-Ala* ¹	6.8 ^{†?}	1.2 [†]	96.0 [†]
	Ala-His* ²	11.8 [†]	4.0 [†]	135.0 [†]
28	Dummy	—	1.8 [†]	100.4 [†]
	His	6.7 [†]	2.5 [†]	142.7 [†]
	Gly	5.0 [†]	1.4 [†]	67.6 [†]
	His-Gly* ¹	6.7 [†]	2.5 [†]	106.2 [†]
29	Dummy	—	0.8 [†]	—
	His	6.8 [†]	1.7 [†]	197.9 ^{†?}
	Gly	6.3 [†]	1.3 [†]	33.1 [†]
	Gly-His* ²	6.7 ^{†?}	7.8 [†]	106.3 [†]
30	Dummy	10.0 [†]	—	67.8 ^{†?}
	His	12.5 ^{†?}	1.8 [†]	112.3 ^{†?}
	His-Gly* ¹	8.3 ^{†?}	1.5 [†]	50.6 [†]
	Gly-His* ²	9.3 ^{†?}	2.5 [†]	108.8 [†]
31	Dummy	—	0.8 [†]	93.3 [†]
	His	12.4 ^{†?}	2.4 [†]	309.9
	Leu	6.0 [†]	0.2 [†]	131.9 [†]
	His-Leu* ¹	10.4 [†]	1.9 [†]	202.6 [†]
32	Dummy	7.2 ^{†?}	—	65.4
	His	12.6 [†]	4.3 [†]	149.0 [†]
	Phe	5.5 [†]	0.5 [†]	70.7 [†]
	His-Phe* ¹	6.3 [†]	3.2 [†]	154.6 [†]
33	Dummy	—	1.2 [†]	123.8 [†]
	His	15.3 ^{†?}	2.2 [†]	189.4 [†]
	Ser	8.3 [†]	1.3 [†]	145.4 [†]
	His-Ser* ¹	16.1 ^{†?}	2.9 [†]	160.9 [†]
34	Dummy	6.2 [†]	0.7 [†]	116.5
	His	12.1 [†]	3.1 [†]	178.2 [†]
	Tyr	6.3 [†]	2.3 [†]	128.7 [†]
	His-Tyr* ¹	7.7 [†]	2.3 [†]	172.6 ^{†?}

Signs and abbreviations; Legend as Table 1.

*¹ and *², Antero- and retro-dipeptides, respectively.

dipeptides including antero and retro types having respectively N-terminal His and C-terminal His in Table 4, the following two antero- and two retro-dipeptides were found to be attractive. The

Table 5. Attraction activities of L-Lys containing L-dipeptides for three species of animals

No.	Dipeptides	Attraction activities		
		A	O	Y
		(a)	(a)	(gr)
35	Dummy	5.2 [†]	2.4 [†]	20.6 ^{†?}
	Lys	11.3 [†]	8.1 [†]	114.4 [†]
	Met	7.2 [†]	—	99.1 [†]
	Met-Lys	11.3 [†]	5.3 [†]	114.2
36	Dummy	4.2 [†]	1.0 [†]	81.3 ^{†?}
	Lys	8.3 [†]	3.4 [†]	120.0 [†]
	Val	6.8 [†]	—	78.9 [†]
	Val-Lys	11.9 [†]	3.5 [†]	135.2 [†]

Signs and abbreviations; Legend as Table 1.

latters were Ala-His (No. 26) for abalone and oriental weatherfish and Gly-His (No. 29) for oriental weatherfish, while the formers were His-Phe (No. 32) for yellowtail and His-Ser (No. 33) for abalone. In the comparative test between the antero- and retro-dipeptides (Nos. 27 and 30), the attraction activities of the latters were higher than those of the formers for all three species of animals.

Of the two specimens of L-Lys containing L-dipeptides (Table 5), only Val-Lys (No. 36) was attractive for the abalone and the yellowtail.

Comparative Test of Attractive L-Dipeptides

The attraction index *a* or *gr* of some attractive L-dipeptides for each of the three test animals was collectively shown in Table 6. The dipeptides tested were selected on the basis of the results of Tables 1–5. For abalone, Gly-Val (No. 37) and Arg-Val (No. 38) were the most potent attractants. For oriental weatherfish, Gly-Asn (No. 39), Gly-His (No. 40) and Arg-Asp (No. 41) were the most potent attractants, and in particular, Gly-His was highest in the attraction activities. Lastly, Gly-Thr (No. 42) and Arg-Ala (No. 43) were the most potent attractants for yellowtail.

Discussion

The attraction activities of a total of 34 specimens of peptides containing 31 L-dipeptides, 2 D-dipeptides and 1 tripeptide, and of 21 specimens of amino acids constituting the peptides for the three species of animals were statistically sought on the basis of behavioral experiments. When the attraction activities, *i.e.*, attraction indexes of dipeptides tested were higher than either of those of the two constituent amino acids and, the peptides were evaluated as effective feeding at-

Table 6. Comparative test of attractive L-dipeptides in three species of animals

No.	Dipeptides	Attraction activities
	A: Abalone	(a)
37	{ Dummy	3.4 [†]
	{ Gly-Phe	5.6 ^{1?}
	{ Gly-Ser	8.3 ^{1?}
	{ Gly-Val	11.5 ^{1?}
38	{ Dummy	6.3 [†]
	{ Arg-Glu	7.5 [†]
	{ Arg-Leu	6.4 [†]
	{ Arg-Val	8.2
	O: Oriental weatherfish	(a)
39	{ Dummy	—
	{ Gly-Ala	1.4 [†]
	{ Gly-Asn	2.7 [†]
	{ Gly-Phe	2.5 [†]
40	{ Dummy	—
	{ Ala-His	1.8 ^{†?}
	{ Gly-His	6.0 ^{1?}
	{ His-Gly	1.0 [†]
41	{ Dummy	0.8 [†]
	{ Arg-Ala	3.4 [†]
	{ Arg-Asp	3.9 [†]
	{ Arg-Phe	1.9 [†]
	Y: Yellowtail	(gr)
42	{ Dummy	43.0 [†]
	{ Gly-Ala	49.4 [†]
	{ Gly-Asn	84.6 [†]
	{ Gly-Thr	164.0 [†]
43	{ Dummy	—
	{ Arg-Ala	104.6 [†]
	{ Arg-Phe	73.5 [†]
	{ Val-Lys	51.7 ^{1?}

Signs and abbreviations; Legend as Table 1.

tractants.

In the experiment of L- and D-dipeptides, and their constituent amino acids in Table 1, L-dipeptides and L-amino acids were generally more active in the attraction behavior than their isomers for all three test animals as previously clarified also for L- and D-amino acids.⁶⁻⁸⁾ Among Gly containing D-dipeptides, the attraction activities of certain D-dipeptides were approximately equivalent to that of Gly. This seems to be largely on the attraction activity of Gly itself. Accordingly, in the following experiments, L-dipeptides were used as test samples.

Attractive dipeptides were roughly classified into three groups, strong, moderate and weak attract-

Table 7. Classification of attractive L-dipeptides for three species of animals by their index values

Dipeptides	Attraction activities*		
	A	O	Y
Gly-Ala	Weak	Moderate	Weak
Gly-Asn		Moderate	Weak
Gly-Asp			Weak
Gly-Gly	Strong		
Gly-Phe	Weak	Strong	
Gly-Sar		Weak	
Gly-Ser	Weak		
Gly-Thr			Weak
Gly-Val	Moderate		
Ala-His	Weak	Weak	
Gly-His		Strong	
His-Phe			Weak
His-Ser	Weak		
Arg-Ala		Moderate	Weak
Arg-Asp	Weak	Moderate	
Arg-Glu	Moderate		Weak
Arg-Leu	Weak		
Arg-Phe		Weak	
Arg-Val	Moderate		
Val-Lys	Weak		Weak

Abbreviations; Legend as Table 1.

* Strong, the attraction indexes are higher than the sum of those of the constituent amino acids; moderate, roughly equivalent to the sum; and weak, higher than either of those of the two amino acids but lower than the sum of them.

ants on the basis of the attraction activities of the peptides in Tables 1-4. The classified list was collectively compiled in Table 7. Strong, moderate and weak attractants were defined according to the value of the attraction indexes of the peptides as follows: those with attraction indexes are higher than the sum of those of the two constituent amino acids (synergistic effect) were strong; Moderate were roughly equivalent to the sum (additive one) and weak were lower than the sum but higher than either of those of the two constituent amino acids (subadditive one). Around ten specimens of dipeptides were effective feeding attractants for each of the three species of test animals and attractive dipeptides generally depended on the species of animal. However, certain dipeptides were considered to be effective as the common feeding attractants for three or two test animals. Only Gly-Ala was a common attractant for all animals. Seven specimens of dipeptides were found to be common attractants for two of the three species of animals used. They were Gly-Asn, Gly-Phe, Ala-His, Arg-Ala, Arg-Asp, Arg-Glu and Val-Lys. Among the three dipeptides,

attractive Gly-Ala, Ala-His and Arg-Ala, the Ala may play an important role of increasing the attraction activities. Furthermore, although acidic amino acids such as Asp and Glu were feeding repellents for oriental weatherfish,¹²⁾ Arg-Asp was a moderate attractant for the fish. It is an interesting finding that the repellence of Asp disappeared by a peptide bond formation between Arg and Asp. Also the majority of arginyldipeptides are most effective for abalone.

Of the attractive dipeptides having strong, moderate and weak activities, strong and moderate attractants were clarified for both abalone and oriental weatherfish but not for yellowtail. From this finding, it is evaluated for both the former two animals that certain dipeptides are mainly involved in the attraction behavior. In contrast, these dipeptides may faintly participate in the attraction behavior as all attractive dipeptides for yellowtail were poor in the attraction activities.

References

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