d) *A. japonicum* THUNB.…F. I. : Mt. Takakusa 1.22～2.16, Mt. Hakone 2.71～5.13, Two ranges depart, so difference is significant.
e) *A. iwatekense* NAKAI…F. I. : Miyako 0.29～3.81, Kawai 7.48～9.44, significant.

SII : For many species, distinctions by habitats are non-significant. However a few following species possess significant distinctions. a) *A. japonicum* : Mt. Takakusa n…54, k_1…54, Mt. Hakone n…19, k_1…12. b) *A. grossidentatum* var. *shikokianum* : Saijō n…19, k_1…19, Motoyama n…29, k_1…23. c) *A. kiusianum* : Kakuto n…13, k_1…3, Takeda n…18, k_1…18.

The author expresses his gratitude to Prof. K. Kimura and Dr. J. Okada of Kyoto University for their guidance throughout the course of this work. The author also expresses his gratitude to President T. Ukai of this College, to Emeritus Prof. E. Ochiai, and to Prof. F. Maekawa of University of Tokyo and Mr. A. Ueno of this College for valuable advices and encouragements. He is indebted to Drs. I. Igura, H. Ageta, T. Kikuchi, Messrs. K. Hosoi, T. Satomi, S. Gomi, Z. Mizuochi, Misses Y. Amano, K. Tsujimoto, S. Yamamoto, R. Yamamoto, Mr. M. Fujita, Miss K. Iwase and many co-operating persons for collection of aconites, and to Mr. T. Ohmura for convenience of literature. Furthermore many forest offices of each localities in this country co-operated for the collection of native aconites, to whom author's thanks are expressed.

Summary

As second feature of stone cells studies stochastically, the two indices namely SII and SIO are created. For stochastical method of SIO rejecting and fiducial intervals were used, however SII fiducial intervals of occurrence rates in three ranks are calculated. The studied results are shown in Table I and II.

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43. Yasuhisa Saiki : Application of Statistics in the Field of Plant Internal Morphology. V.*1 On Japanese Aconites. (3).

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In previous papers, statistical studies were performed on forms of cambium rings and number of stone cells in tuberous roots of Japanese aconites. So the author intends to consider in combining these results.

All distribution ranges of each specific value, namely rejectancial ellipses of E/C and $\log_{10}(S^2/C)$, rejecting limits of SIO fiducial intervals of occurrence rates of SII, are crossed among most species, so basic distinctions among many Japanese aconites are hardly observed. Besides those the existence of other conspicuous features in internal structure of tuberous roots are not considered. Determination of species by microscopic study seems almost impossible generally in single or a few samples, however in some species, for example *Aconitum subcuneatum* NAKAI, considerable different distinctions are observed.

On the contrary, the methods of fiducial interval of mean are able to argue distinction on increasing the number of samples, and increasing more samples the more accurate ranges are obtained, and then slight differences are detectable. However 20～30

*1 This paper constitutes part of a series entitled "Application of Statistics on the Field of Plant Internal Morphology" by the late Toshikazu Harada. Part IV : This Bulletin, **10**, 274 (1962).
*2 Oshika, Shizuoka (斎木保久).

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samples are available for each studied material in consideration of general application, because slight distinctions in several samples are not detectable practically.

Actually, from the results by these methods, internal structures of Japanese aconites are devided roughly in several types, as shown in Table I.

TABLE I. Structural Types of Tuberous Roots of Japanese Aconites

Specific values: Fiducial limits of means of confidence of 95%				
$\log_{10}(S^2/C)$	E/C	SIO	SII	Name of Plant
1.5～	3.2～4.1	7.3～ 9.5	×	*Aconitum subcuneatum*
1.3～1.5	2.7～3.4	0.8～ 2.2	×	*A. Mazimai*
	3.1～3.6	7.2～10.2	×	*A. spp.* (Iwaya)
	3.4～4.2	3.8～ 5.9	×	*A. spp.* (Sōma)
1.1～1.3	～3.1	1.8～ 6.5	?	*A. grossidentatum*
		4.8～ 8.1	×	*A. aizuense*
		8.6～11.0	×	*A. Zuccarinii*
	3 ～4	～ 1.5	×	*A. spp.* (Akataki)
		2.5～ 6.5	○	*A. crassipes*
			×	*A. gr.* var. *shikokianum*, *A. iwatekense*
		2.8～ 7.4	○	*A. luciduscul*um
		6.6～	○	*A. sachalinense*, *A. senanense*
			×	*A. yesoense*, *A. Okuyamai*, *A. sanyoense*, *A. spp.* (Shimoboro)
	4 ～	1.8～ 2.8	×	*A. japonicum*
		3.0～ 5.9	○	*A. kiusianum*
		12.5～17.3	○	*A. deflexum*

○ marks in ranks of SII show frequent occurrence of stone cells in central cylinder.

However, in above mentioned structural types, intermediate forms occur often, so some times distinction of native aconites is rather difficult. Besides, these results include littleconsideration of habitats in some kinds, as described in previous papers. This reason is due to existence of several doubtful points in Nakai's taxonomical theory,[1] and diffculty of distinctions from outer appearance of each plant, because distinctive features are unrecognizable by observations of wild states. Many kinds of plants recorded by Nakai can be distinguished hardly often from each other, for examples several kinds of aconites growing in northern Honshu, namely *A. subcuneatum* NAKAI, *A. Zuccarinii* NAKAI, *A. Mazimai* NAKAI, *A. aizuense* NAKAI, *A. Okuyamai* NAKAI and *A. iwatekense* NAKAI, resemble closely and seem almost to be same species. However, Ochiai, *et al.*[2] reported that components of native aconites in this district are different in each habitats, especially from narrow areas such as Shimokita peninsula in Aomori prefecture, besides these studied plants are not almost distinguishable. Above mentioned plants were treated as different kinds in consideration of medicinal importance. And in order to avoid confusion by misjudgement, they are selected by natives for type localities and neighborhoods in each species. Therefore in some kinds, variation of statistical values produced by habitats may be larger than these experimental values. Furthermore it is observed that statistical distinction in same kind is often significant among different habitats, so causes of significance are considered to be due to habitats in some cases of significant distinctions between another sprcies.

1) Nakai : Bulletin of Natl. Sci. Museum (Tokyo), **32**, 1～52 (1953).
2) E. Ochiai, *et al.* : Yakugaku Zasshi, **75**, 545, 550, 634, 990 (1955), etc.

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Solution of the problem concerning the relations of components of aconites and their kinds or their circumstances must be acted by cooperation of chemists and botanists. However, the author's observations in wild states of many kinds maintain the opinion that many kinds recorded as many species hitherto are thought to be almost local forms, there are merely a few species in Japanese aconites. And then, the opinion accords with hitherto mentioned results of statistical studies.

At last, internal structures of tuberous roots of Japanese aconites resemble closely each other and are almost impossible to discriminate definitely, as expressing in this series of studies, so native tuberous roots must not be used for medicine except after the strict determinations of toxicity and pharmacological actions. Therefore, in order to utilize native Japanese aconites, pharmacological studies must be performed on crude drugs which are prepared by detoxication of poisonous tuberous roots or from cultivation of nontoxic plants, namely *A. luciduscul*um NAKAI, *A. sanyoense* NAKAI and its var. *tonense* NAKAI, and two unidentified kinds growing in Shimoburo in Shimokita Peninsula and Mt. Takao in Tokyo Prefecture.

The author expresses his deep gratitude to Prof. K. Kimura and Dr. J. Okada of Kyoto University for their guidance throughout the course of these studies. The author also expresses his gratitude to President T. Ukai of this College, to Emeritus Prof. E. Ochiai, and to Prof. F. Maekawa of University of Tokyo and Mr. A. Ueno of this College for valuable advices and encouragements. He is indebted to Drs. I. Igura, H. Ageta, T. Kikuchi, Messrs. K. Hosoi, T. Satomi, S. Gomi, Z. Mizuochi, Misses Y. Amano, K. Tujimoto, R. Yamamoto, Mr. M. Fujita, Miss K. Iwase and many co-operating persons for collection of acontites, and to Mr. T. Ohmura for conveyance of literature. Furthermore many forest offices of each locality in this country co-operated for collection of native aconites, to whom the author's thanks are expressed.

Summary

By combining the results from previous papers, Japanese aconites are devided into several structural types by use of average results conveniently.

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44. Takahiro Nakamura, Yasuhiro Murase, Ryozo Hayashi, and Yonekichi Endo : Studies on the Total Synthesis of *dl*-Colchiceine.[1] I. Synthesis of 3-Hydroxy-9,10,11-trimethoxy-1,2,3,4,6,7-hexahydro-5*H*-dibenzo[*a*,*c*]cycloheptatrien-5-one.

(*Takamine Laboratory, Sankyo CO., Ltd.*[*1])

The structure of colchicine, the chief alkaloid of *Colchicum autumnale* L., has been established as formula (I). Absolute configuration of the amido group in the B-ring was determined by Corrodi and others,[2] the structure of the C-ring was proposed by Šantavý and Čech,[3] and confirmed by X-ray defraction work by Pepinsky and others.[4]

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1) A part of this work has been published as brief communications in This Bulletin, 8, 843 (1960); 9, 81 (1961).
2) H. Corrodi, E. Hardegger : Helv. Chim. Acta, 38, 2030 (1955).
3) J. Čech, Fr. Šantavý : Collection Czechoslov. Chem. Communs., 14, 532 (1949).
4) M. V. King, J. L. de Vries, R. Pepinsky : Acta Cryst., 5, 437 (1952).

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