

The Study on Flora and Distribution Characteristics of Orchidaceae on Moor

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Total 7 moors, Yong-neup on Mt. Daeam, Chilbo Mt. moor, Dogapsa-neup on Mt. Wolchul, Wangdeungjae-neup on Mt. Jiri, Mujechi-neup on Mt. Jungjok, Buljae-neup on Mt. Kyungak and Geoinri-neup on Dongsang, were investigated by literatures and survey. Distribution, conditions, and similarity of dominant species and Orchidaceae on moor were analyzed. The results are follows;

There are total 46 wetland plant species observed more than twice from 7 moors. The plants classified as constancy class V, which are appeared more than 80%, are *Iris ensata* var. *spontane*, *Juncus effusus* var. *decipiens*, *Sanguisorba tenuifolia* var. *alba*, *Habenaria linearifolia*, *Sium ninsi*, *Lobelia sessilifolia*, *Lastrea thelyptoris*, and *Eupatorium chinensis* var. *simplicifolium*.

Highly appearing Orchidaceae, which was classified to constancy class IV plant, are *Habenaria linearifolia*, *Pogonia japonica*, *Epipactis thunbergii*, and *Platanthera mandarinorum*. They are the typical index plants of the moors.

Habitual environment of *Habenaria radiata* and *Platanthera hologlottis* can be affected by environmental aspects such as latitude, altitude and the water quality. However those of *Habenaria linearifolia*, *Epipactis thunbergii*, and *Pogonia japonica* are not affected by latitude and altitude, but may be determined by water condition of wetland.

As the result of similarity index analysis for appearance of Orchidaceae identifying each moors in the view of species composition, swamps at Dogapsa-neup and Buljae-neup are very similar. However Yong-neup is totally different from those of Dogapsa-neup and Buljae-neup. Yong-neup had shown the high similarity indices of 0.85 and 0.75 with Wangdeungjae-neup and Mujechi-neup, respectively.

Growth properties of wild Orchidaceae at wetland were almost similar. *Platanthera mandarinorum* and *Liparis kumokiri* had characteristics of good adaptability. Most of them need light. *Pogonia* was the only long-day plant. The flowering time of these Orchidaceae was from May to September.

Key words : Moor, Flora, Orchidaceae, Distribution, Similarity index

1. Introduction

Recently, the protection and systematic management of national biological resources is appeared as principal problem of each country. And our country, special wildlife were indicated legally by Government of Environment to conserve natural ecosystem and maintain biodiversity. But this is based on the number of each species and scarcity. So the protection

and management policy about the special natural ecosystem of lime stone area or wetland etc. is very mimid in present condition¹⁾.

Korea is putting under international pressure of joining the Ramsar treaty. Therefore identifying of distribution of wetlands in Korea and biological species in there were needed for conservation of wetlands.

Aquatic plants distributed in a swamp are ecologically very important. Moor vegetation is developed under special situation such as high humid or lack of nutrition that could not form forest^{2,3)}. Special vegetation is consisted of some species adapted to special environment developed on a moor. Therefore moore is very important

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in scientifically and naturally for its vegetation. Yong-neup is the first research site in Korea except North Korea. Koh *et al.*⁴⁾ reported the moor vegetation and flora at Chilbo mountain moor, Suwon. Mujechi-neup at Jeongjok mountain, Ulsan and Wangdeungjae-neup at Jiri mountain are found after that. Biological and ecological interests about moor are spreaded.

Grasp of flora and plant species composition of growing on moor is important base for understanding the ecological structure and function of a moor.⁵⁾ Especially Orchidaceae is regarded as very sensitive index plant, and most of the wild plants endangered.

Function and structure of moor can be indirectly decided with distribution of Orchidaceae.

The objectives of this study are investigating the characters of Orchidaceae growing on a moor of five already known and two newly discovered by survey.

2. Methods

2.1 Study area

The highest moor of this study is Yong-neup at Daeam mountain, and located 1,200 m above sea level. Wandejunjae-neup at Jiri mountain is located 950 m above sea level. Moor at Chilbo mountain, Dogapsaneup at Wolchul mountain, and Gerinri-neup at Dongsang, Wanju are lowly located under 200 m above sea level (Fig. 1, Table 1). Area of moors are ranged from 0.1ha of Gerinri-neup to 15ha of Mujechi-neup. Highmoor at Daeam mountain is designated as a natural monument No. 246 and Nature conservation area. Wangdeungjae-neup and Dogapsa-

neup are included at National park of Jiri mountain and Wolchul mountain, respectively. Mujechi-neup is protected as ecological conservation area.

2.2 Flora survey

Survey of a moor plant was performed by literature review^{2,4,6,7)} and on the spot investigation. Yong-neup at Daeam mountain was surveyed May 1999. The other moors were surveyed twice as June 2000 and 2001.

Plant observation list was recorded when a plant was observed more than twice at a moor. Constancy was grasped by observation rate. Orchidaceae found at each moor were investigated the similarity of species composition. Similarity index of Orchidaceae observation was analyzed by Sorenson index ($CCs = 2C/S_1 + S_2$) while each spot was designated as OTU (Operating Taxonomic Unit).

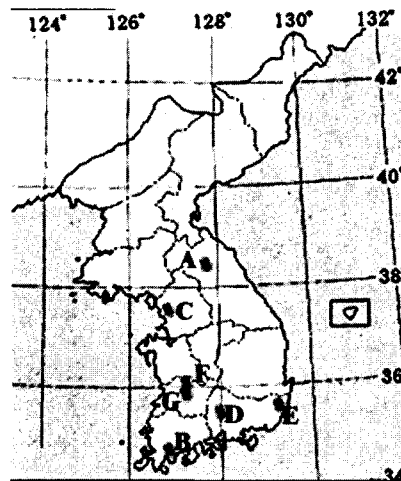


Fig. 1. Distribution of surveyed moors.

Table 1. Surveyed moors

Mark	Moor name*	Location	Elevation (m)	Area size (ha)
A	Yong-neup on Mt. Daeam	Yong Gu · Injae-Gun, Kangwon-Do	1,200	15.00
B	Chilbo Mt. moor	Suwon-Si · Whasung-Gun, Gyunggi-Do	110	0.25
C	Dogapsa-neup on Mt. Wolchul	Yungam-Gun, Jeonranam-Do	180	0.10
D	Wangdeungjae-neup on Mt. Jiri	Sanchung-Gun, Gyungsangnam-Do	950	1.20
E	Mujechi-neup on Mt. Jungjok	Ulju-Gun, Ulsan-Si	700	15.00
F	Buljae-neup on Mt. Kyungak	Imsil-Gun, Jeonrabuk-Do	350	0.80
G	Geoinri-neup on Dongsang	Wanju-Gun, Jeonrabuk-Do	190	0.10

* Naming of existing research and first namer was respected. And C, F, G are the names of moor named by this researcher on research convenience.

3. Results and Discussion

3.1 General view of wild herbaceous plants of moor

Total 46 genera including 34 species and 12 varieties were observed. Thirty-four species were observed at Mujechi-neup, 31 species at moor of Chilbo mountain. However only 19 species were observed at moor of Dogapsa-neup. Species diversity was higher at upper and middle than mountainous moor (Table 2).

In table 1, *Iris ensata* var. *spontanea*, *Juncus effusus* var. *decipiens*, *Sanguisorba tenuifolia* var. *alba*, *Habenaria linearifolia*, *Sium ninsi*, *Lobelia sessilifolia*, *Lastrea thelyptoris*, and *Eupatorium chinensis* var. *simplicifolium* were

put into constancy group V. *Caltha palustris* var. *membranacea*, *Lycopus ramosissimus* var. *japonicus*, *Juncus krameri*, *Drosera rotundifolia*, *Phragmites communis*, *Epipactis thunbergii*, *Scirpus karuizawensis*, *Isachne globosa*, and *Pogonia japonica* were belong to Group IV.

It was peculiar that three species, *Drosera rotundifolia*, *Utricularia bifida*, and *Utricularia racemosa* were very highly observed. There was no naturalized plants in this observation list. This reflects the moors are the only wild plant habitat.

3.2 Wild Orchidaceae on moors

Surveyed Orchidaceae were 10 isolates of 5 genera, 8 species, 1 variety, and 1 cultivar (Table 3). *Habenaria linearifolia* was put into

Table 2. List of hygrophytes distributed in moors (observed more than twice)

Scientific name	Distribution Site							No. of species	Common name
	A	B	C	D	E	F	G		
<i>Iris ensata</i> var. <i>spontanea</i>	○	○	○	○	○	○	○	7	꽃창포
<i>Juncus effusus</i> var. <i>decipiens</i>	○	○	○	○	○	○	○	7	골풀
<i>Sanguisorba tenuifolia</i> var. <i>alba</i>	○		○	○	○	○	○	6	가는오이풀
<i>Habenaria linearifolia</i>		○	○	○	○	○	○	6	잠자리난초
<i>Sium ninsi</i>	○	○	○	○	○	○		6	감자개발나물
<i>Lobelia sessilifolia</i>		○	○	○	○	○	○	6	숫잔대
<i>Lastrea thelyptoris</i>	○		○	○	○	○	○	6	치녀고사리
<i>Eupatorium chinensis</i> var. <i>simplicifolium</i>		○	○	○	○	○	○	6	등골나물
<i>Caltha palustris</i> var. <i>membranacea</i>	○			○	○	○	○	5	동의나물
<i>Lycopus ramosissimus</i> var. <i>japonicus</i>	○			○	○	○	○	5	쉽사리
<i>Juncus krameri</i>	○	○	○			○	○	5	비녀골풀
<i>Drosera rotundifolia</i>	○	○	○		○		○	5	끈끈이주걱 *
<i>Phragmites communis</i>	○		○	○	○		○	5	갈대
<i>Epipactis thunbergii</i>		○		○	○	○	○	5	닭의난초
<i>Scirpus karuizawensis</i>		○	○	○	○	○		5	솔방울고랭이
<i>Isachne globosa</i>		○	○	○	○	○		5	기장대풀
<i>Pogonia japonica</i>	○		○	○	○		○	5	큰방울새란
<i>Carex dickinsii</i>	○		○	○	○			4	도깨비사초
<i>Persicaria sieboldi</i>	○	○	○			○		4	미꾸리뉘시
<i>Utricularia bifida</i>		○	○		○		○	4	땅귀개 *
<i>Utricularia racemosa</i>		○	○		○		○	4	이삭귀개 *
<i>Parnassia palustris</i>		○	○	○	○			4	물매화
<i>Carex dispalata</i>	○	○		○	○			4	삿갓사초
<i>Platanthera mandarinorum</i>		○	○			○	○	4	산제비란
<i>Astilbe chinensis</i> var. <i>davidii</i>	○			○	○		○	4	노루오줌
<i>Carex canescens</i>	○	○		○	○			4	산사초
<i>Hemerocallis fulva</i>	○		○		○	○		4	원추리
<i>Ligularia fischeri</i>	○			○	○			3	곰취

Table 2. Continued

Scientific name	Distribution Site							No. of species	Common name
	A	B	C	D	E	F	G		
<i>Eriocaulon sieboldianum</i>			○			○	○	3	곡정초
<i>Veratrum patulum</i>	○		○		○			3	박새
<i>Hololeion maximowiczii</i>			○			○	○	3	깨묵
<i>Gentiana triflora</i>	○			○	○			3	과남풀
<i>Arundinella hirta</i>	○					○	○	3	새
<i>Swertia diluta</i> var. <i>tosaensis</i>			○			○	○	3	개쓴풀
<i>Geranium eriostemon</i> var. <i>megalanthum</i>	○			○	○			3	꽃쥐손이
<i>Sphagnum palustre</i>	○		○		○			3	물이끼
<i>Miscanthus sacchariflorus</i>				○	○			2	물억새
<i>Platanthera hologlottis</i>	○			○				2	흰제비란
<i>Filipendula koreana</i>	○			○				2	붉은터리풀
<i>Scirpus wallichii</i>		○	○					2	수원고랭이
<i>Potentilla fragarioides</i> var. <i>major</i>	○		○					2	양지꽃
<i>Eleocharis mamillata</i> var. <i>cyclocarpa</i>	○				○			2	물꼬챙이풀
<i>Onoclea sensibilis</i> var. <i>interrupta</i>			○				○	2	야산고비
<i>Allium sacculiferum</i>			○		○			2	참산부추
<i>Molinia japonica</i>			○		○			2	진퍼리새
<i>Majanthemum bifolium</i>	○				○			2	두루미꽃
Total taxa	28	19	31	26	34	21	23	46	

heavy writing is Orchideace, * are insectivorous plants

constancy group V, and *Pogonia japonica* and *Epipactis thunbergii* were put into group IV. Those were highly observed and *Platanthera mandarinorum* of group IV was followed.

Habenaria radiata and *Liparis kumokira* were only observed at Chilbo mountain moor (Fig. 2a).

Koh *et al.*⁴⁾ reported that *Habenaria radiata* at Chilbo mountain is considered as character species of *Hololeion maximowiczii*-*Habenaria radiata* community, lower community observed in *Molinia japonica*-*sphagnum palustre* community group.

In Mujechi-neup, also *Molinia japonica*-*sphagnum palustre* community is observed, but *Habenaria radiata* is not observed. It is considered that *Habenaria radiata* is affected by environmental aspects such as latitude, altitude and vertical factor. *Habenaria radiata* is understood as moor plant which is formed in rested paddy field of Gyung-buk Sangju, Gang-won Inje etc. and demilitarized area in South Korea except survyed area.

However *platanthera hologlottis* is observed

in the swamp of Yong-neup at Mt. Daeam, Wangdeungjae-neup at Mt. Jiri and in the swamp higher than 1,000 m at Mt. Halla etc.

So it may be considered as special as Northern type flora that this species is distributed in cold wet belt of east Asia.⁸⁾ Therefore it is considered that this species were typically observed in the swamp higher than 1,000 m. But it is considered that *Habenaria linearifolia* and *Epipactis thunbergii*, *Pogonia japonica* are important as indicator plants which is distributed in the swamp having constant water condition.

Habitual environment of *Habenaria radiata* and *Platanthera hologlottis* can be affected by environmental aspects such as latitude, altitude and the water quality. However those of *Habenaria linearifolia*, *Epipactis thunbergii*, and *Pogonia japonica* are not affected by latitude and altitude, but may be determined by water condition of wet land. They are the typical index plants of the moors.

The life form of Orchidaceae in moor are all Emergent plants.

Table 3. Suveied Orchidaceae in Each moor

Genus	Scientific name	Distribution Site							No. of species	Common name
		A	B	C	D	E	F	G		
<i>Habenaria</i>	<i>H. radiata</i>			○					1	해오라비난초
	<i>H. linearifolia</i>		○	○	○	○	○	○	6	잠자리난초
<i>Platanthera</i>	<i>P. mandarinorum</i>		○	○			○	○	4	산제비란
	<i>P. mandarinorum</i> var. <i>neglecta</i>					○			1	하늘산제비란
	<i>P. hologlottis</i>	○			○				2	흰제비란
<i>Pogonia</i>	<i>P. japonica</i>	○		○		○		○	5	큰방울새란
	<i>P. japonica</i> for. <i>pallescens</i>			○					1	흰큰방울새란
	<i>P. minor</i>							○	1	방울새란
<i>Epipactis</i>	<i>E. thunbergii</i>		○		○	○	○	○	5	닭의난초
<i>Liparis</i>	<i>L. kumokira</i>			○					1	옥잠난초
Total taxa		2	3	6	4	4	3	5	10	

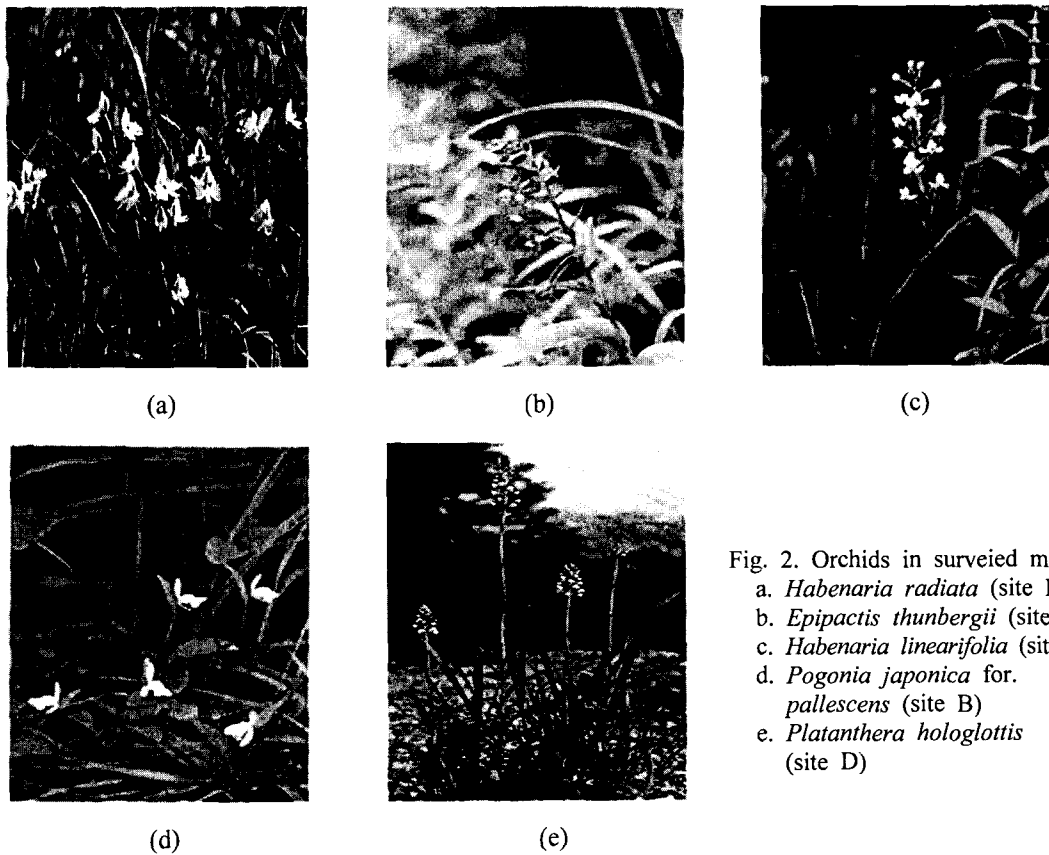


Fig. 2. Orchids in surveied moor.
 a. *Habenaria radiata* (site B)
 b. *Epipactis thunbergii* (site F)
 c. *Habenaria linearifolia* (site G)
 d. *Pogonia japonica* for. *pallescens* (site B)
 e. *Platanthera hologlottis* (site D)

3.3 Species composition similarity of moor Orchidaceae

Similarity analyzed by Sorenson index was presented on Table 4.

Similarity index was 1.0 between moors of Dogapsa-neup and Buljae-neup mountain. However similarity index was 0.00 between Yong-neup at Daeam mountain and moors of Wolchul and

Table 4. Orchidaceae's Similarity index of moors

		Site						
		A	B	C	D	E	F	G
Site	A		0.00	0.25	0.67	0.33	0.00	0.25
	B	0.00		0.22	0.57	0.28	1.00	0.85
	C	0.25	0.22		0.40	0.40	0.44	0.55
	D	0.67	0.57	0.40		0.85	0.57	0.66
	E	0.33	0.28	0.40	0.85		0.57	0.66
	F	0.00	1.00	0.44	0.57	0.57		0.75
	G	0.25	0.85	0.55	0.66	0.66	0.75	

Kyungkak mountain. While similarity index was relatively high as 0.85 between Wangdeungjae-neup and Mujechi-neup. Yong-neup was most similar with Wangdeungjae-neup, similarity index 0.67 among 6 investigated moors. This was due to similarity of high moor. Buljae-neup shown relatively high similarity of 0.75 with Geoinri moor. This also due to similarity of low moor.

Similarity index of this study was obtained by existence of Orchidaceae not by dominant species in the survey area. Therefore this may be different from the plant sociological view. However peculiar species composition was formed by the view of species composition.

3.4 Ecology and morphology of moor Orchidaceae

Platanthera mandarinorum and *Liparis Kumokiri* were put into Terrestrial orchids by growth characters. However they were relatively well

adapted to water level change. All species were deciduous and short day plants except *Pogonia*. All observed species were put into facultative shade plant type.^{8,9)} However the decision of this is needed to be postponed because of low green occupancy rate by Tree layer(T₁) and Subtree layer(T₂) from May to September.

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