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Research Article

An Autecological Study on *Iris pseudacorus L. (Iridaceae)*

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Abstract: The ecological properties of *Iris pseudacorus* L., a marsh plant species, were investigated. The analysis of N%, P% and K% in the below-ground and above-ground parts of the plant was carried out. In addition, soil samples were collected and their physical and chemical aspects were analyzed.

Key Words: *Iris pseudacorus L.* Autecology.

Iris pseudacorus L. (Iridaceae) Üzerinde Otekolojik Bir Çalışma

Özet: Bu çalışmada, bir bataklık formu olan *Iris pseudacorus* L. ekolojik yönden incelenmiştir. Ekolojik incelemelerde türün topraküstü ve toprakaltı kısımlarında %N, %P ve %K analizleri yapılmıştır. Ayrıca bitkinin yaygın olduğu lokalitelerden alınan toprak örnekleri de fiziksel ve kimyasal yönden analiz edilmiştir.

Anahtar Sözcükler: *Iris pseudacorus L.* Otekoloji

Introduction

The genus *Iris* L., an economically valuable genus used in decoration, is comprised of rhizomatous and bulbous species. *Iris pseudacorus* L. is a rhizomatous plants 60-165 cm in length. This species usually prefers aquatic habitats, being a marsh plant species (1-2). In this case, they may be a useful indicator of spring water and water seepage (3). It is known as yellow flag, sesame, adder's tongue, rush rose and turniprose by the local people. It is also called yellow *Iris* marshy *Iris* baldhead, and sword gross (4). Nevertheless, local people use the rhizomes of this plant to treat eczema. It is known that the rhizomes have diuretic effects and the seeds as a gas remover. The seeds also used as coffee after drying (5).

The aim of this study was to determine element concentrations of the below-ground and above-ground parts of *I. pseudacorus* at different growth stages. In addition, some ecological differences were determined. Although there have been some studies on this subject (6, 7, 8) they are not sufficient. Therefore, the aim of this study is to contribute to this subject for further studies.

Material and Methods

Localities

Taflan (1), Dereköy Merkez District (2), West side of Yörükler Geleriç (Eğrimeşe) wood (19 Mayıs) (4), Yörükler Fevzi Çakmak District (19 Mayıs) (5), Yörükler School side (19 Mayıs) (6), Yörükler Fındıklı District (7), The south of Karkucak District (Terme) (8), The north of Karkucak District (Terme) (9), The north of Yalı District (Terme) (10), The south of Yalı District (Terme) (11), Müdürük District (Terme) (12), Kavakdibi District (Çarşamba (13), Beylerce District (Çarşamba) (14), Çakırlar (19 Mayıs (15) and Hamamayağı (Ladik) (16).

Analysis of plant and soil samples

Soil and plant (10 plants from each area) samples were collected from study areas in vegetative and generative growth periods. The below-ground and above-ground parts of plant samples were divided into small pieces and dried at 70°C in an oven for 48 hours and then grinded by plant mill. Nitrogen analysis of plant samples which had been ground were carried out according to Kjeldahl's method. For K and P analysis, samples were

digested with percloric acid-nitric acid (1:4) according to the wet-combustion method. Phosphor analysis was carried out after reaction with molybdate and stannous chloride, measuring the absorbance at 640nm by spectrophotometer. Potassium analysis was conducted by Petracourt PFP one-flame photometer (9-10). Approximately 1 kg of soil was collected from 0-30 cm of depth for each locality for analysis. The soil samples were treated by sieve for chemical and physical analysis after air drying at room temperature. Structure was analyzed by the Bouyoucus hydrometer method, pH by Beckman pH meter, $CaCO_3$% by Scheibler Calcimeter and total salinity designate by conductive bridge.

Organic material was determinated by the Walkey-Black method and N% by Kjeldahl's method, P% by ammonium molibdate-tin chloride method and K% by flame photometer (9, 10). The analysis of plants and soil samples were evaluated according to Kaçar (11). The t test was used to evaluate all values obtained.

Results

Phenological Observations

Leaf development and primary shoot	April
Leaf maturation	At the begining of May
Flowering	In the middle of May
Complete flowering	In the end of May
Fruit	June
Seed maturation	In the end of June
Drying of upper part of plant	July-August

Observation on habitats

The plants growth such as valley edge, marshy place which is near the agricultural space, reed bed and lake environment.

Physical characters of soil

The results of physical analysis from the soil samples collected from the distrubution area of *I. pseudacorus* are presented in Table 1. According to physical analysis results, the species generally grows on sandy and loamy soil as well as loamy, clayish, and clayish-loamy soils. The pH of the soil samples ranged from 6.65 to 7.55. The concentration of $CaCO_3$ ranged from 0.49% to 14.84% where the species grows. However, the species was collected from soil containing low or medium concentration of $CaCO_3$. That is, the amount of total salt is fairly low. The proportion of salt ranged from 0.05% to 0.12%.

Chemical characters of soil

Chemical analyses of soil samples are given in Table 2. The concentration of organic material was found to be 2.58-7.51 in the vegetative period and 2.02-6.77 in the generative period. The nitrogen concentration was 0.792-1.76 in the vegetative period and 0.709-1.418 in the generative period. On the other hand, the phosphate concentration was 0.001-0.009 in vegetative period and 0.001-0.004 in the generative period. The potassium concentration was found to be 0.012-0.065 in the vegetative period and 0.008-0.05 in the generative period. The concentration of potassium was the lowest in soil samples 4, 6 and 11 (Table 2).

Concentration of N, P and K in the above- and below-ground parts of *I. pseudacorus*

The N, P and K concentrations of the above-ground parts of the plants are given in Table 3. According to the results, the N concentration was found to be 0.849-2.138 in the vegetative and 0.793-1.756 in the generative period while the phosphate concentration ranged from to 0.165 to 0.370 in the vegetative period and from to 0.131-0.355 in the generative period. The K concentration was 1.81-3.96 in the vegetative period and 1.70-2.94 in the generative period. According to these results, it was determined that the quantity N is sufficient in the above-ground parts of the plant in vegetative and generative periods. It was also found that the above-ground parts were rich in phosphate for each growth period. Potassium concentration was also detected in acceptable amounts for the vegetative and generative periods.

The N, P, and K concentrations of the below-ground parts of the plant are given in Table 4. According to the results, nitrogen concentration was 0.690-2.162 in the vegetative period and 0.787-2.287 in the generative period and was found to be at a sufficient level for each period. Although phosphate concentration was 0.034-0.355 in most soil samples, it was at the minimum level in samples 2, 4, 5, 6, 8, 10 and 11. On the other hand, phosphate concentration ranged from 0.064to 0.385 in the generative period. In general, the quantity of P was sufficient, but in areas 4, 5, 6 and 11, it was close to minimum. The concentration of potassium ranged from 0.71 to 2.51 in the vegetative period and 0.79 to 3.19 in the generative period. Nitrogen concentration was

Table 1. Physical analysis results on the soil sample of *I. pseudacorus* habitats

Locality	Clay (%)	Silt (%)	Sand (%)	Texture class	pH	$CaCO_3$	Total salinity (%)
1	17.42	21.09	61.49	Sandy-Loamy	7.15	7.97	0.06
2	32.14	27.21	40.65	Argillaceous-Loamy	6.95	3.19	0.08
3	7.33	10.67	82.00	Loamy-Sandy	7.55	6.37	0.03
4	4.63	10.25	85.12	Loamy-Sandy	7.35	0.80	0.04
5	16.30	11.59	73.11	Sandy-Loamy	7.30	7.65	0.06
6	16.25	11.50	73.25	Sandy-Loamy	7.10	7.60	0.05
7	8.48	10.52	81.00	Sandy-Loamy	7.40	6.50	0.08
8	24.81	29.82	45.37	Loamy	7.20	8.29	0.06
9	13.31	20.46	66.23	Sandy-Loamy	7.10	4.78	0.08
10	23.44	19.54	57.02	Sandy-Argillaceous Loamy	6.90	0.49	0.08
11	31.76	19.31	48.63	Sandy-Argillaceous Loamy	6.75	0.49	0.08
12	9.09	14.79	76.12	Sandy-Argillaceous Loamy	6.65	1.59	0.12
13	33.67	42.61	23.72	Argillaceous-Loamy	7.25	8.44	0.08
14	23.30	31.82	44.88	Loamy	7.10	10.36	0.08
15	40.53	19.98	39.49	Argillaceous	7.10	2.69	0.09
16	39.84	31.79	28.37	Argillaceous-Loamy	6.90	14.84	0.09

Table 2. Chemical analysis results on the soil sample of *I. pseudacorus* habitats

Locality	N%	P%	K%	Organic Matter
1	0.825*/0.778**	0.005/0.003	0.06/0.05	4.60/3.60
2	1.012/0.968	0.005/0.004	0.07/0.05	3.95/3.47
3	0.930/0.855	0.002/0.001	0.01/0.01	4.88/4.80
4	0.793/0.715	0.003/0.002	0.01/0.009	2.58/2.02
5	1.530/1.418	0.001/0.001	0.01/0.01	3.59/3.05
6	0.817/0.793	0.002/0.001	0.01/0.009	3.12/2.98
7	0.810/0.797	0.001/0.001	0.03/0.02	4.70/4.02
8	0.792/0.709	0.002/0.001	0.01/0.01	2.67/2.50
9	0.895/0.805	0.003/0.002	0.03/0.02	5.78/4.72
10	1.076/0.994	0.002/0.001	0.02/0.01	7.51/6.55
11	0.881/0.763	0.001/0.001	0.01/0.008	4.35/3.97
12	1.071/0.947	0.002/0.001	0.06/0.05	7.30/6.77
13	0.923/0.768	0.005/0.004	0.06/0.04	4.62/3.65
14	0.937/0.893	0.003/0.002	0.01/0.01	5.78/5.07
15	0.922/0.812	0.005/0.003	0.06/0.05	5.80/5.40
16	0.901/0.770	0.004/0.003	0.02/0.01	4.91/4.08
* Vegetative period	X=0.945/0.862	X=0.002/0.001	X=0.03/0.02	X=4.76/4.17
** Generative period.	t=1.34 P>0.05	t=2.00 P<0.05	t=1.03 P>0.05	t=1.21 P>0.05

Table 3. Concentration of N, P, K in above-ground parts of *I. pseudacorus*

Locality	N%	P%	K%
1	1.648*/1.509**	0.355/0.310	2.201/1.89
2	1.532/1.133	0.258/0.228	1.81/1.76
3	2.096/1.348	0.303/0.228	3.27/2.94
4	1.386/1.13	0.165/0.131	2.11/1.95
5	1.227/1.023	0.370/0.258	3.02/2.36
6	1.1570/0.985	0.355/0.310	2.92/2.25
7	1.92/1.185	0.165/0.165	2.99/2.58
8	1.406/1.185	0.303/0.235	3.46/2.94
9	2.138/1.11	0.295/0.206	2.75/2.11
10	1.141/1.082	0.228/0.165	2.53/1.81
11	1.065/0.917	0.280/0.243	3.63/2.53
12	0.849/0.793	0.295/0.235	3.54/2.72
13	1.810/1.756	0.235/0.191	3.63/2.88
14	1.781/1.076	0.280/0.265	3.96/1.70
15	1.234/1.112	0.370/0.355	3.18/2.87
16	1.178/1.042	0.280/0.258	2.95/2.31
* Vegetative period	X=1.473/1.175	X=0.283/0.236	X=2.99/2.35
	SE=0.388/0.255	SE=0.063/0.058	SE=0.604/0.445
** Generative period	t=2.57 P<0.05	t=2.19 P<0.05	t=3.45 P<0.05

Table 4. Concentration of N, P, K in below-ground parts of *I. pseudacorus*

Locality	N%	P%	K%
1	0.702*/0.871**	0.138/0.198	1.29/1.54
2	0.761/0.790	0.056/0.116	0.77/1.56
3	0.942/1.127	0.124/0.146	1.29/2.72
4	1.24/1.501	0.034/0.064	0.85/1.29
5	0.746/0.936	0.071/0.094	0.71/1.29
6	0.776/0.850	0.071/0.085	0.91/1.27
7	1.747/1.886	0.1657/0.176	2.51/3.02
8	1.372/1.517	0.094/0.116	0.88/0.90
9	0.837/0.937	0.138/0.176	0.90/3.19
10	0.712/0.796	0.094/0.116	0.88/0.90
11	0.690/0.787	0.049/0.064	0.88/1.54
12	0.698/0.960	0.138/0.155	1.23/1.65
13	2.162/2.187	0.355/0.385	0.88/1.07
14	0.988/1.317	0.191/0.258	0.71/0.79
15	1.314/1.518	0.138/0.146	0.92/1.22
16	1.421/1.620	0.182/0.228	0.76/1.55
X=Means	X=1.069/1.225	X=0.127/0.157	X=1.023/1.594
SE=Standart error	SE=0.437/0.436	SE=0.772/0.822	SE=0.438/0.738
*Vegetative period	t=1.01	t=1.07	t=2.66
**Genetative period	P>0.05	P>0.05	P<0.05

within normal limits. In addition, K and P concentrations were within normal limits for each growth period.

Results and Discussion

I. pseudacorus has a low ecological tolerance. This species is an indicator of watery places since it prefers soils with higher humidity (12). In addition, it is known that water in the main factor affecting the distribution of this plant species. Furthermore, since the plant prefers areas beside freshwater, it may be an indicator of fresh or salty water (3). It has been determined that the species prefers sandy and loamy soils, according to soil samples analyzed from the distribution area. In contrast, salt concentration was found to be very low. *I. pseudacorus* is distributed over calcareous soils which included a low or medium level of $CaCO_3$ and preferred neutral or low-alkaline soils (Table 1).

Nitrogen concentration was within normal levels in soil samples, which were rich in terms of organic materials. Phosphate concentration was at a medium rich level. Potassium concentration was within optimum limits, with the exception of samples 4, 6 and 11.

No differences between the vegetative and generative periods were found in terms of N, K and organic materials ($P>0.05$). However, the P concentration was higher in the vegetative than in the generative periods ($P<0.05$).

It was observed that N, P and K concentrations were higher in the vegetative period, according to chemical analysis of above- and below-ground parts. A decrease in the generative period was also observed. This can be explained by the intensive physiological activities in the above-ground parts in the vegetative period and by the transporation of elements to the above-ground parts. Furthermore, N, P, and K rates were high in green above-ground parts due to young cells with high cytoplasm at the begining of the generative period. However, a reasonable decrease can be observed in these elements because of the thickening of cell walls in the middle of the vegetation period. The elements were transporated to below-ground parts for the plant's survival until the next vegetation period.

Similar results have been observed in other studies about *Asphodelus aestivus* Brot. (6), *Leucojium aestivum* L. (17), *Galanthus rizehensis* Stern. (13) and *Pancratium maritimum* L. (14).

No differences in between the vegetative and generative periods in terms of N and P in the below-ground part of the plant ($P>0.05$). On the other hand, K concentration was higher in generative period than in the vegetative, which is significant according statistical analysis ($P<0.05$). One reason might be the high bolitiy of K ions in this plant.

In this study some ecological properties of *I. pseudacorus* were presented in detail. We hope that this work will illumunate ecological studies on economically important *Iris* species.

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