

## DETERMINATION ON THE AGRICULTURAL AND QUALITY PROPERTIES OF *URTICA PILULIFERA* L. (ISIRGAN) UNDER BORNOVA ECOLOGICAL CONDITIONS

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### S U M M A R Y

Five species of nettle (*Urtica* sp.) are found in Turkey. Stinging Nettle (*Urtica pilulifera* L.), is naturally distributed in the temperate zone of the world. It contains proteins, flavonoids, fatty acids, vitamins and minerals. So, its leaves, roots and seeds are used for food, fiber, herbal medicine, colour agent and cosmetic industry.

*U. pilulifera* is an annual plant and its seeds are locally called "black nettle seed". The species hasn't been cultivated yet in agriculture. The aim of this study is to investigate the properties of the nettle and also to research cultivating of *U. pilulifera*.

The research was conducted in the experimental fields of the Department of Field Crops, Faculty of Agriculture, Ege University, in the growing periods of 2005 and 2006. In the trial, seeds of *U. pilulifera* from Antalya are used. 100 plants from the field trial were selected and they were harvested. Plant height (cm), root length (cm), yield of the plant (gr), yield of the root (gr/plant), number of branches (pieces/plant), number of globose pedunculate heads (pieces/plant) and yield of globose pedunculate heads (gr/plant) were determined in the field experiment. Total oil percentage of the seeds was analyzed.

### Ö Z E T

Dünyanın birçok ılıman bölgesinde ve Türkiye'de doğal yayılış gösteren ısırganın ülkemizde 5 türü bulunmaktadır. İçeriğinde protein, sterol, flavonoid, yağ

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asitleri, vitaminler ve mineraller gibi çeşitli maddeler bulunmaktadır. Bu zengin içeriği sayesinde bitkinin yaprak, kök ve tohum gibi kısımları çeşitli alanlarda (gıda olarak, lif üretiminde, boya ve kozmetik sanayiinde) kullanılmaktadır.

Türkiye’de yetişen ve halk arasında tohumlarına “Kara Isırgan Tohumu” denen *Urtica pilulifera* L. tek yıllık ve henüz üretime alınmamış bir bitkidir. Bu çalışmada bitkinin kültüre alınması, bazı tarımsal ve kalite özelliklerinin belirlenmesi amaçlanmıştır.

Antalya yöresinden sağlanan *Urtica pilulifera* L. bitkisinin tohumları, 2007-2008 yılları arasında Ege Üniversitesi Ziraat Fakültesi Tarla Bitkileri Bölümü Bornova deneme alanında kültüre alınarak tek tek bitkilerde, bitki boyu (cm), kök boyu (cm), bitki verimi (gr), kök verimi (gr/bitki), bitki dal sayısı (adet), küremsi başçık sayısı (adet/bitki) ve küremsi başçık verimi (gr/bitki) özellikleri incelenmiştir. Tohumdaki toplan yağ oranı araştırılmıştır.

**Key Words:** *Urtica pilulifera* L., stinging nettle, agronomic traits, cultivate, oil.

## INTRODUCTION

*Urticaceae* family is naturally distributed in tropic and subtropic regions. The family contains 45 genera and approximately 1000 species, it is represented by 2 genus and 9 species in Turkey. The genus *Urtica* is important member of the family and has got 35 species 5 of them grow in Turkey. *Urtica* species are annual/perennial and monoecious/dioecious herbaceous, its leaves are opposite (12). Their flowers are yellowish-green and they are often nitrophilous and ruderal plants (14).

Natural *Urtica* samples are used as nutrients in many places, but any statistic data about its economic value has not been found. So far it hasn't been cultivated under the field conditions. It is estimated that if it has produced cultivated under the field conditions, it could be got 3,0-3,5 ton/decar green herbage and 1t/da dried drug (8). *Urtica pilulifera* (5, 12) grow naturally in western and southern Anatolia. The species is 30-100 cm, annual and monoecious herbs (14, 12). The leaves are dentate with petiole. Female flowers are as 1-1.5 mm diam., globose heads on slender axillary's peduncle, male flowers in dense clusters on slender branches of lax axillary inflorescences (5). This species is characterized with many cells stinging hairs. Acetylcholine, histamine, serotonin components are secreted from the stinging hairs. Skin of humans is very sensitive against these substances. Histamine and acetylcholin cause burning effect on the skin (4). Leaves, roots, rhizome and seeds are used as medicine.

Herbal parts of *U. pilulifera* (Herba Urticae) is used as external for rheumatism and sciatica of treatment; as tea against to diabetes in folk medicine; seeds (*Semen Urticae*) are used to treatment of cancer. Herbal and radix extracts are prepared for

prostate according to ESCOP Monographs; also its shampoos are produced from herbal parts (14).

Two *Urtica* species are used for Folium Urticae: *U. dioica* L. *U. urens* L. The drug of nettle seeds (*Fructus Urticae piluliferae*), that only it is sold as the "Seeds of *Urtica* in Turkey (other name is Black Nettle Seed)", are obtain from mature fruits of *U. pilulifera*. These seeds are 3 mm, egg shape, shiny, dark color and similar to flax seed and contain fixed oil and mucilage. When it is put in water, a layer of mucilage occurs on the water. The seeds of *U. pilulifera* are used as relieve rheumatic pains, urine enhancer, menstrual generating, antipyretic and laxative effects since Dioscorides. Although there isn't any scientific publication in the treatment of cancer, this species is used against to cancer in folk medicine in Turkey (4). Ethnobotanical uses *U. pilulifera* are published by Abu-Rabia (1) in Palestine, it is used as diuretic and to treat kidney stone and infections (fresh leaves are eaten) also used against to cancer, prostate, rheumatism and arthritis in Palestine, wound healing and inflammation in Israel (2).

*U. pilulifera* drugs were obtained with collected from nature. It has not been cultivated so far. Also any scientific publication has not been found on this issue. In our study; we aim to determine some yield and some quality characteristics on each plant, on the other hand our aim is to get information with more detail and research to possibilities of culturing about this important plant

## MATERIALS AND METHODS

This research was conducted between 2007-2008 years in Ege University, Faculty of Agriculture, and Department of Field Crops. Field trials were made in Bornova, İzmir. The soil structure of the field trial is with clay-ting, alüviyal, heavy, chalky medium alkaline. Total nitrogen is intermediate level, useful phosphorus is poor, useful potassium is rich structure. The research material constituted the population of *U. pilulifera* which is originated from Antalya. The seeds provided from Western Anatolia Agricultural Research Institute (BATEM).

The experiment was established; plant seeds as 1.5 kg/da seeding rate, 40 cm. intra-row spacing, and 20 cm row spacing are planted on November 28th. 2007. A total of 6 kg/da of pure nitrogen fertilizer, ammonium sulfate (21%); A total of 2 kg/da of pure phosphor fertilizer, triple super phosphate (42-44%) were applied to the soil at once. All the necessary maintenance of the plants was carried out during the vegetation. When seeds were fully matured, one hundred of plants were selected and harvested with radix on June 6th. 2008.

In the study; the plant height (cm), the root height (cm), yield of the plant (gr/plant), yield of the root (gr/plant) numbers of the branches (unit/plant), numbers of the globose heads (unit/plant), yield of the globose heads (gr/plant) on each plant were

examined. Because of the first study as agronomy, some agricultural characters of *U. pilulifera* (nettle) are named according to Botanical Manual (English-Turkish) (3). In addition, due to the properties of nettle plants required to use gloves during all procedures

The extract oil (fixed oil) was obtained from the seeds of *U. pilulifera* using Soxhlet Extraction method (6, 7) and n-hexane, separated from the amount of oil extract, by using Rotary evaporator. Fixed oil rate (%) of the seed was calculated.

## RESULTS

Some agronomical and quality characteristics of cultivated *U. pilulifera* (nettle) on each plant (100 units) were determined. Research results and obtained by the data minimum, maximum and average values (Table 1) and frequency distribution tables were given in this section.

**Table 1.** Minimum, maximum and average values of the characteristics which examined on the individual plants of the *U. pilulifera* (nettle).

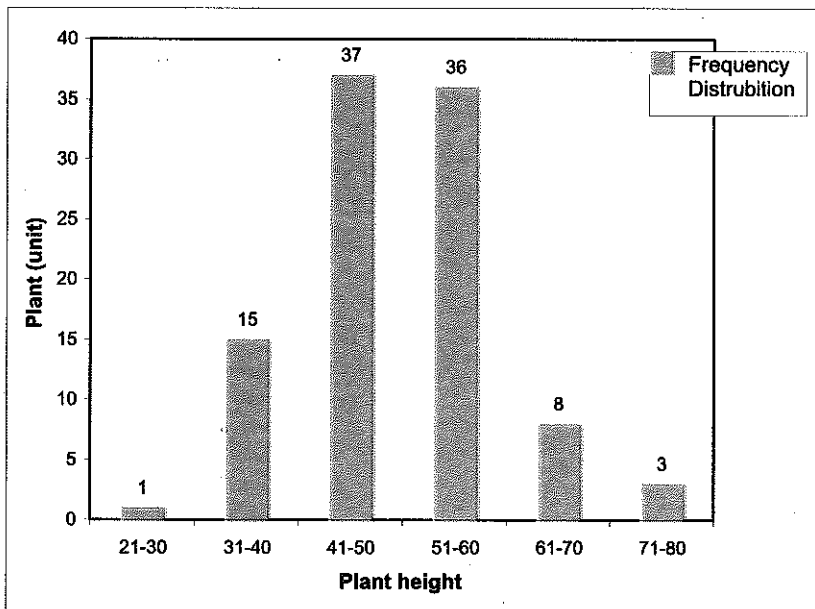
	the plant height (cm)	the root height (cm)	yield of the plant (gr/plant)	yield of the root (gr/plant)	numbers of the branches (unit/plant)	numbers of the globose heads (unit/plant)	yield of the globose heads (gr/plant)
Min.	27	6	1,1	0,1	1	12	0,1
Max.	74	21	76,3	10,4	32	176	29,8
Average.	49,82	13,24	12,863	0,882	10,75	64,8	6,978
St. Deviation	8,996498	3,19444	11,81965	1,336238	6,364953	32,83629	5,995547
Sx	0,89965	0,319444	1,181965	0,133624	0,636495	3,283629	0,599555
Variance	80,93697	10,20444	139,7042	1,785531	40,51263	1078,222	35,94658

Some Standard Deviations were highest. This indicates us that; there was wide variation of the plant population. This is expected and desired result.

**The plant height (cm):** Frequency distribution of the plants height (cm) is presented in Table 2. The plants were harvested with roots from at the point surface the soil to the peak of the plant measured as cm. The plant height was determined between 27 and 74 cm. 73 % of all plants, had got 41-60 cm height (Figure 1).

**Table 2:** Frequency distribution of the plants height (cm) on the individual plants on the *U. pilulifera* (nettle)

Number Distance	Value Distance	Unit	%(rate)
1	21-30	1	1
2	31-40	15	15
3	41-50	37	37
4	51-60	36	36
5	61-70	8	8
6	71-80	3	3



**Figure 1.** The plants height (cm) on the individual plants of the *U. pilulifera* (nettle)

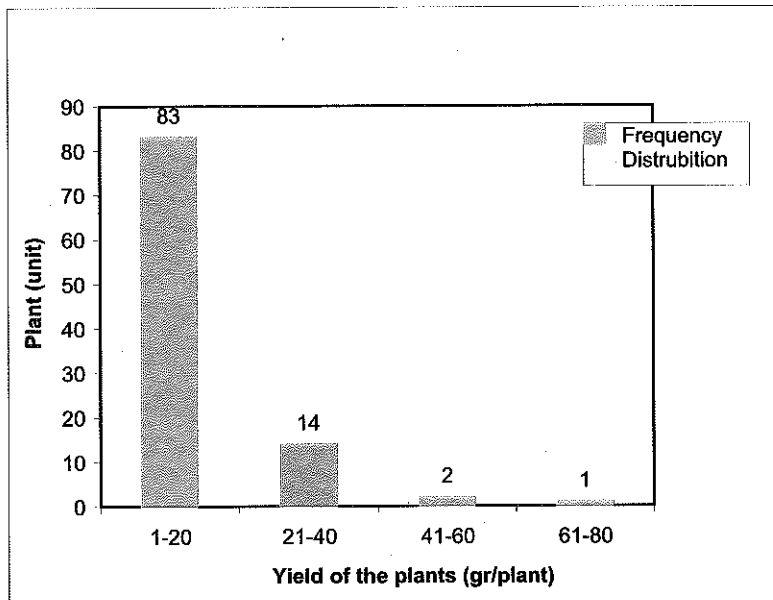
**The root height (cm):** The root heights of the plants were measured as cm from at the point surface the soil to the end point of the plant root. The root height on individual plants of the *U. pilulifera* (nettle) changed 6-21 cm (Tablo 1).

**Yield of the plant (gr/plant):** Frequency distributions of the plants height (cm) are presented on individual plants of the *U. pilulifera* (nettle) in Table 3. The harvested plants with roots, they were weighed one by one after. Yield of the plant had changed between 1.1 and 76.3 gr/plant and 83 % of all plants, had got 1-20 gr The rate yield of

the plants just were 1 % that the plants had got the yield of the plant between 61 and 80 gr/plant (Figure 2).

**Table 3:** Frequency distribution of the yield of the plant (gr/plant) on the individual plants of the *Urtica pilulifera* L. (nettle)

Number Distance	Value Distance	Unit	%(rate)
1	1-20	83	83
2	21-40	14	14
3	41-60	2	2
4	61-80	1	1



**Figure 2.** The yield of plants (gr/plant) on the individual plants of the *U. pilulifera*

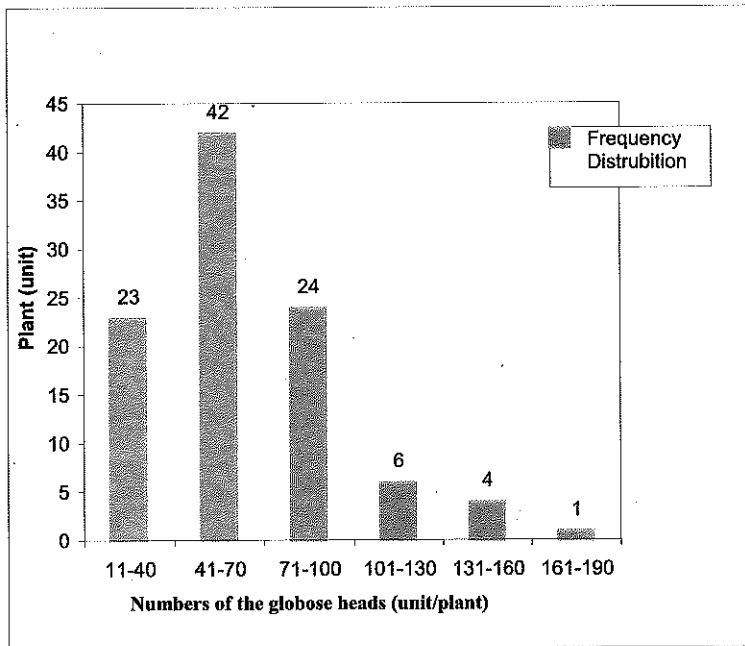
**Yield of the root (gr/plants):** The variation between 0.1-10.4 at yield of the roots on individual plants of the *U. pilulifera* (nettle) are seen in Table 1.

**Numbers of the branches (unit/plant):** Numbers of the branches were determined between 1 and 32 on individual plants of the *U. pilulifera* (nettle) (Table 1).

**Numbers of the globose heads (unit/plant):** Frequency of the distribution of numbers of the globose heads with seeds (unit/plant) on individual plants of the *U. pilulifera* (nettle) was given on Table 4. The globose heads on every plant were counted one by one. This quantity has changed from 12 unit/plant to 176 unit/plant with plants. The rate of numbers of the globose heads between 41-70 unit/plant, was 42 %; the rate of the changing between 71-100 unit/plant identified as 24 % are seen in Figure 3.

**Table 4.** Frequency distribution of numbers of the globose heads (unit/plant) on the individual plants of the *U. pilulifera* (nettle).

Number Distance	Value Distance	Unit	% (rate)
1	11-40	23	23
2	41-70	42	42
3	71-100	24	24
4	101-130	6	6
5	131-160	4	4
6	161-190	1	1

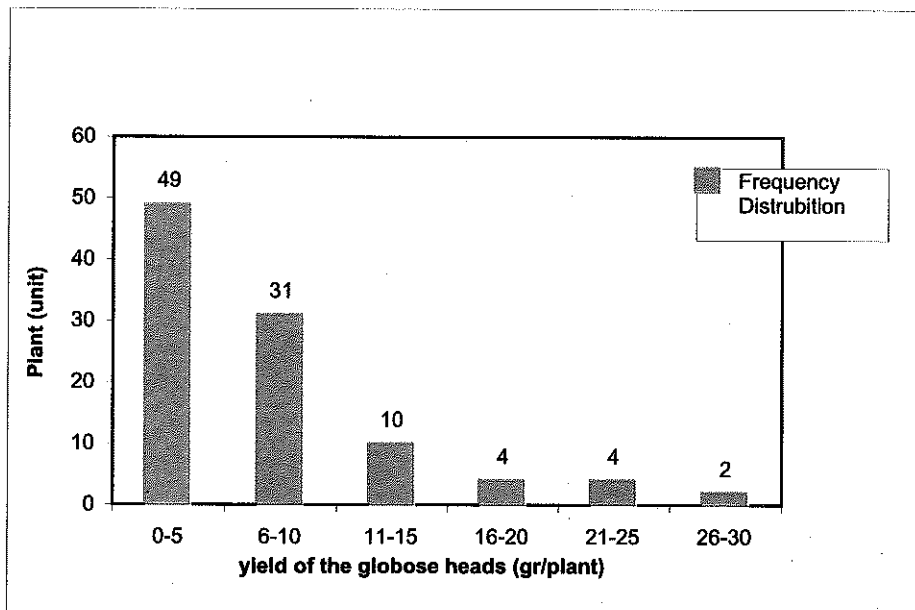


**Figure 3.** Numbers of the globose heads (unit/plant) on the individual plants of the *U. pilulifera*.

**Yield of the globose heads (gr/plant):** Frequency of the distribution of yield of the globose heads with seeds (gr/plant) on individual plants of the *U. pilulifera* (nettle) were given on Table 5. The globose heads on all of the branches of every plant were collected and weighed. Table 5 examined, 90 % of plants has got at distance of the 0-15 gr yield of the globose heads (unit/plant). Yield of the globose heads which were contained seeds changed between 0.1 and 29.8 gr. according to the plant.

**Table 5.** Frequency distribution of yield of the globose heads (gr/plant) on the individual plants of the *U. pilulifera* (nettle)

Number Distance	Value Distance	Unit	% (rate)
1	0-5	49	49
2	6-10	31	31
3	11-15	10	10
4	16-20	4	4
5	21-25	4	4
6	26-30	2	2



**Figure 4.** Yield of the globose heads (gr/plant) on the individual plants of the *U. pilulifera*



In addition one each globose heads taken randomly from every 100 plants and counted the seeds inside it and then 4 and 27 units seeds were identified.

**The seed fixed oil rate (%):** The fixed oil were obtained from the seeds of *U. pilulifera* by using Soxhlet Extraction (FAO, 1996; Hışıl, 2007). The samples which has got the maximum seed yield were combined and the analysis was conducted as two parallel.

## DISCUSSION

In this research some yield and quality characteristics were examined on the cultivated *U. pilulifera* (nettle) species.

On the individual plants of 100 *U. pilulifera* (nettle); the plant height 27-74 cm, the root height 6-21 cm, yield of the plant 1,1-76,3 gr/plant, yield of the root 0,1-10,4 gr/plant, numbers of the branches 1-32 unit/plant, numbers of the globose heads 12-176 unit/plant, yield of the globose heads 0,1-29,8 gr/plant, were investigated. The species hasn't been cultivated yet in agriculture in parallel with, there is not any publication about its cultivation and agricultural results to compare. Baytop (4) stated *U. pilulifera* species height between 30 and 100 cm, in our study; plant height changed between 27 and 74 cm and so these results have been found to close the value

The average seeds fixed oil (extract oil) was found 26 % in this study. In another study made by Ljubuncic et. all. (10), water extraction yields leaves and stems of *U. pilulifera* collected in April and May which are used against to cancer, intestinal pain, liver diseases for stomach, circulatory system in traditional Arab medicine in Israel, this percentage were given as 13 %.

Lectin is found in *U. pilulifera* seeds by Treasure (13), this seeds extracts caused to decrease the serum creatinine levels. In the other study, Lectin is isolated from the seeds for responsible hypoglycemic activity (9) and investigated the effect of the diabetic mice. Özbek et. all (11), toxic fixed oil wasn't found even 12.8 ml/kg doses the seeds of the *U. pilulifera* in their study, fatal doses essential oil and fixed oil of some medicinal plants.

This important medicinal plants must be investigated all aspects *Urtica pilulifera* L. and continue the cultivation studies.

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## REFERENCES

1. Abu-Rabia, A. Herbs as a Food and Medicine Source in Paletsine. *Asian Pacific J Canser Prev*, Vol 6, 404-407, (2005).
2. Ali-Shtayeh, M., Yaniv, Z., Mahajna, J., Ethnobotanical survey in the Palestinian area: a classification of the healing potential of medicinal plants. *Journal of Ethnopharmacology*, 73, 221-232, (2000).
3. Baytop, A., İngilizce-Türkçe Botanik Kılavuzu, İ.Ü.Yay. No:4058/Ecz. Fak. Yay. 70, İstanbul, 975-404-482-1, (1998).
4. Baytop, T. Türkiye'de Bitkilerle Tedavi, 231-232, (1999).
5. Davis, P.H., Flora of Turkey and The East Aegean Islands Vol. 9, Edinburg University, (1985).
6. FAO, Food and Nutrition Paper, 14/8, 256, 261, (1996).
7. Hışıl, Y., Enstrümental Gıda Analizleri Lab. Deneyleri, E.Ü. Müh. F. Yay., 4-5, İzmir, (2007).
8. İlisulu, K., İlaç ve Baharat Bitkileri, A.Ü. Zir. Fak. Yay., Ankara, 129-130, (1992).
9. Kavalalı, G., Tuncel, H., Göksel, S., Hatemi, H.,H., Hypoglycemic activity of *Urtica pilulifera* in streptozotocin-diabetic rats. *Journal of Ethnopharmacology*, 84, 241-245, (2002).
10. Ljubuncic P., Azaizeh H., Portnoya, I., Cogan, U., Said, O., Saleh, K.,A., Antioxidant activity and cytotoxicity of eight plants used in traditional Arab medicine in Israel. *Journal of Ethnopharmacology*, 99, 43-47, (2005).
11. Özbek, H., Öztürk, M., Öztürk, A., Ceylan, E., Yener, Z., Determination of Lethal Doses of Volatile and Fixed Oils of Several Plants. *Eastern J. Medicine* 9,(1):04-06, (2004).
12. Seçmen, Ö., Gemici, Y., Görk, G., Bekat, L., Leblebici E., Tohumlu Bitkiler Sistematiği, E.Ü. Basımevi, Bornova, İzmir, 181-182, (1995).
13. Treasure, J., Urtica semen reduces serum creatinine levels. *J. American Herbalist Guild*, 4(2):22-25, (2003).
14. Zeybek, N., Zeybek, U., Farmasötik Botanik - Kapalı Tohumlu Bitkiler (*Angiospermae*) Sistematiği ve Önemli Maddeler, E.Ü. Ecz. Yay., Bornova, İzmir, 175-176, (1995).