

The effect of method of plantation establishing on yield and chlorophyll concentration of stinging nettle (*Urtica dioica* L.) in the first year of cultivation

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Summary

Different methods of nettle cultivation were estimated in the experiment: vegetative propagation with runners planted in spring and generative propagation: autumn direct seed sowing in the field and transplant production in greenhouse (in multicell trays or plastic boxes) as well as nursery bed in the field. Seedlings were planted on 5 May. The plants were cultivated in spacing 45 x 15 cm, 45 x 25 cm and 45 x 35 cm. The best method of establishing nettle plantation was planting the seedlings produced in greenhouse: in multicell trays and bare root transplants obtained in plastic boxes. The highest percentage of leaves in total yield of herb was observed in treatment with planting of seedling produced in multicell trays and with vegetative propagation by runners. Significant effect of spacing on total yield of herb and leaves was not observed.

Key words: stinging nettle, methods of cultivation, spacing, yield, chlorophyll content

Stinging nettle (*Urtica dioica* L.) is known as a valuable drug both in scientific and folk medicine. The high content of vitamins as well as macro- and microelements justify its use in the form of a nutritious tonic with homeostatic activity [1]. This herb is recommended in the therapy of arteriosclerosis, rheumatism, diabetes, allergic rhinitis and benign prostatic hyperplasia [2]. There was observed a high antimicrobial activity of stinging nettle leaf extract against some bacteria, fungi and viruses [3]. Externally the plant is used to treat skin complaints, especially eczema, arthritic pain, gout, neuralgia, hemorrhoids, hair problems. Nettle has a large number of other potential applications including fiber, biomass and oil production, as well as liquid feed for plants, dye, repellent and waterproofing

[4]. Nowadays this plant is also cultivated for its high level of chlorophyll used as a natural pigment in food and cosmetic production. It is also a promising plant for sustainable natural fiber production, in particular in Germany and Central Europe [5].

Stinging nettle is considered to be a weedy, invasive species, which occurs in moist sites along streams, open forests and ditches, on mountain slopes, in woodland clearings, and in disturbed areas such as roadsides and old fields. Information on cultivation methods of nettle is limited [6, 7]. Vegetative propagation with cuttings is simple, but this process is very laborious, particularly in case of large scale production. Alternatively seeds can be sown in late fall to allow the following spring germination [4, 7, 8].

The aim of the study was to estimate the effect of method of nettle cultivation on yield of herb and chlorophyll content in first year after planting.

MATERIAL AND METHODS

The field experiment was carried out in 2002–2005 at Piastów Horticultural Research Station, on fine, clay soil. Different methods of nettle cultivation were estimated: 1 - vegetative propagation with runners, 2 - direct seed sowing in the field, 3 - transplant production in greenhouse in multicell trays and 4 - in plastic boxes, 5- transplant production in the nursery bed in the field. In plastic boxes and nursery bed bare root transplant were produced.

Direct seeding in the field was done in the first week of November. Greenhouse transplant was produced in multicell trays with one cell volume of 76.5 cm³ and in plastic boxes filled with peat substrate. Nettle seeds were sown on 20 March. In other treatment transplants were produced in the field on nursery bed from seeds sown on 20 March. Seven-week-old transplants and runners (collected from the natural site) were planted on the plots on 5 May using spacing of 45 x 15 cm, 45 x 25 cm and 45 x 35 cm. In treatment with direct seed sowing on plots, the seedlings were thinned to the same spacing.

Stinging nettle was fertilized with nitrogen 100 kg N·ha⁻¹ (50+50) given as pre-plant dose and one top dressing with ammonium nitrate. The experiment was established as a two factorial design in four replications with 1 m² total area of plot.

The herb was harvested twice a year: in the third week of June and in the last week of September. Total yields of fresh herb and leaves were estimated.

In samples of leaves collected before each harvest content of chlorophyll a+b in fresh material [7] and dry matter content were determined.

RESULTS AND DISCUSSION

The method of plantation establishing had significant effect on yielding of stinging nettle in the first year of cultivation (Table 1). The best method of establishing the nettle plantation was planting the seedlings produced in greenhouse: in multicell trays or use of bare root transplants obtained in plastic boxes. Significan-

tly lower yield of herb and leaves was noticed in treatment with vegetative propagation by runners. Autumn direct seed sowing in the field was only slightly better method than spring planting of bare root transplant from nursery bed. Szewczuk [8] stated that planting of runners was a better method of establishing the nettle plantation than direct seed sowing in the field. The quality of crop expressed by participation of leaves in total yield of herb was also affected by method of stinging nettle cultivation.

Table 1.

The effect of cultivation method and spacing on yielding of stinging nettle in first year of growing (mean for 2003–2005).

treatment	total yield of herb [kg/m ²]	total yield of leaves [kg/m ²]	% of leaves in herb	% of 1st cut yield in total yield
1 st factor: method of cultivation				
1. vegetative propagation by runners	1.40	0.71	48.77	23.57
2. direct seed sowing in the field	1.03	0.39	41.69	25.24
3. transplants produced in multicells	2.62	1.30	49.28	30.00
4. bare root transplant produced in greenhouse	2.18	0.81	41.28	21.10
5. bare root transplant produced in the field	0.72	0.28	44.33	25.00
LSD $\alpha=0.05$	0.28	0.12		
2 nd factor: spacing [cm]				
45x15	1.49	0.64	45.80	28.85
45x25	1.66	0.78	45.52	27.10
45x35	1.64	0.75	47.10	22.56
LSD $\alpha=0.05$	n s	n s		

The highest percentage of leaves in total yield of herb was observed in planting of seedling produced in multicell trays and in vegetative propagation by runners. The lowest one was obtained when seeds were sown directly in the field and when bare root transplant was produced in the field. The share of leaves in total yield of herb depends on stage of growth of nettle. It is highest before full blooming and during full blooming time. Decreases when the herb is harvested in vegetative stage and after blooming [8-10]. The percentage of yield obtained from first cut varied between 21.1% and 30% of total yield, and was the highest when transplants were produced in greenhouse in the pots. The effect of spacing on total yield of herb and leaves was not significant. Percentage of leaves in total yield of herb was also similar in all spacing used in experiment. The highest share of 1st cut in total yield of herb was noticed in treatment with 45 x 15 cm spacing (28.85%), the lowest one when plants were grown in 45 x 35 cm spacing (22.56%).

The lowest chlorophyll concentration in leaves of nettle was observed in treatment with direct seed sowing in the field, and in the rest treatments differences in content of this pigment were rather negligible (Table 2). The effect of spacing on content of chlorophyll in the nettle leaves was not significant. The level of dry matter in leaves was higher than in stems. There was no difference in dry matter content among tested treatments.

Table 2.

The effect of method of cultivation and spacing on chlorophyll concentration and content of dry matter in leaves of stinging nettle (mean for 2003–2005).

treatment	chlorophyll a+b [mg·g ⁻¹ f.m.]		dry matter (%)			
	1 st cut	2 nd cut	leaf		stem	
			1 st cut	2 nd cut	1 st cut	2 nd cut
1 st factor - method of cultivation						
1. vegetative propagation by runners	1.18	1.48	31.68	30.00	23.65	25.21
2. direct seed sowing in the field	1.01	1.38	30.70	31.85	22.89	23.51
3. transplants produced in multicells	1.20	1.44	30.41	30.28	26.34	22.99
4. bare root transplant produced in greenhouse	1.20	1.44	31.61	30.51	21.55	24.08
5. bare root transplant produced in the field	1.20	1.49	32.20	31.49	22.89	23.14
LSD $\alpha=0.05$	0.06	0.05				
2 nd factor - spacing (cm)						
45x15	1.15	1.46	30.52	30.85	24.23	23.82
45x25	1.14	1.43	31.37	30.87	24.05	24.05
45x35	1.18	1.45	32.08	30.86	23.12	23.49
LSD $\alpha=0.05$	ns	ns				

CONCLUSIONS

1. The best method of establishing the nettle plantation was planting of seedlings produced in greenhouse in multicell trays and bare root transplants obtained in plastic boxes.
2. The highest percentage of leaves in total yield of herb was observed in planting the seedlings produced in multicell trays and with vegetative propagation by runners.
3. Spacing had no significant effect on total yield of herb and leaves.
4. The lowest chlorophyll concentration in leaves of nettle was observed in treatment with direct seed sowing in the field.

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WPŁYW METODY ZAŁOŻENIA PLANTACJI NA PLONOWANIE I ZAWARTOŚĆ CHLOROFILU W POKRZYWIE ZWYCZAJNEJ (*URTICA DIOICA* L.) W PIERWSZYM ROKU UPRAWY

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Streszczenie

W doświadczeniu oceniano różne metody zakładania plantacji pokrzywy zwyczajnej: wegetatywnie z ukorzenionych kłaczy, generatywnie z siewu jesiennego bezpośrednio na pole, z rozsady produkowanej w szklarni w wielodoniczkach i skrzynkach wysiewnych, z rozsady produkowanej na rozsadniku. Rośliny wysadzano w pole 5 maja w rozstawie 45 x 15 cm, 45 x 25 cm i 45 x 35 cm. Za najlepszą metodę zakładania plantacji należy uznać sadzenie rozsady wyprodukowanej w szklarni w wielodoniczkach i skrzynkach wysiewnych (rozsada rwana). Największy udział liści w plonie całkowitym ziela uzyskano z obiektów obsadzonych sadzonkami wegetatywnymi i rozsadą z wielodoniczek. Nie odnotowano istotnego wpływu zastosowanej rozstawy na plon ziela i liści pokrzywy zwyczajnej.

Słowa kluczowe: pokrzywa zwyczajna, metody uprawy, rozstawa, plon, chlorofil