Acta et Commentationes, Exact and Natural Sciences
Volume 19(1), 2025, Pages 141–149
CZU: 633.7:58:330
ISSN: 2537-6284
E-ISSN: 2587-3644
DOI: 10.36120/2587-3644.v19i1.141-149

The study thyme of varieties (*Thymus* and *Satureja*) from the collection of the Institute of Genetics, Physiology and Plant Protection of Moldova State University

Lilia Chisnicean, Zinaida Vornicu, and Tamara Jelezneac

Abstract. Over the course of several years, within the collection of the Institute of Genetics, Physiology and Plant Protection of Moldova State University (IGPPP of MSU), various thyme varieties from the genera *Thymus* and *Satureja*, which have a special place among aromatic and culinary species, have been studied and tested. This paper presents an analysis of the results obtained from open field testing of four thyme varieties belonging to the *Satureja* and *Thymus* genera. The following important characteristics for these species were elucidated: quantitative morphometric parameters, raw material yield, pharmaceutical herb production, essential oil output per hectare, seminological indices, and propagation methods. The dissemination of these results led to the develolopment of the new two varieties: *Satureja montana* L. 'Alfa-14' and *Thymus* × *citriodorus* – 'Lyli-roz', which have been submitted, registered and patented by the authorized bodies in the Republic of Moldova.

Keywords: genus, variety, thyme, production, essential oil, seeds.

Studiul varietăților de cimbru (*Thymus* și *Satureja*) din colecția Institutului de Genetică, Fiziologie şi Protecţie a Plantelor al Universităţii de Stat din Moldova

Rezumat. În decurs de mai mulți ani, în colecțiile Institutului de Genetică, Fiziologie și Protecția Plantelor al Universității de Stat din Moldova (IGFPP al USM) au fost studiate și testate mai multe varietăți de cimbru din genurile *Thymus* și *Satureja*, care au un loc aparte printre speciile aromatice și condimentare. Această lucrare este analiza rezultatelor obținute din testările în condiții de teren deschis a 4 varietăți de cimbru ale genurilor *Satureja* și *Thymus*. Au fost elucidate așa caractere importante pentru aceste specii: parametrii morfometrici cantitativi, producția de materie primă, herba farmaceutică, ulei esențial per hectar, indicii seminologici și metodele de multiplicare. Diseminarea acestor rezultate a fost făcută prin elaborarea a două soiuri de *Satureja montana* L. – 'Alfa-14' și *Thymus* × *citriodorus* – 'Lyli-roz', transmise, înregistrate și brevetate de către organele abilitate din Republica Moldova.

Cuvinte-cheie: gen, varietate, cimbru, producție, ulei volatile, semințe.

1. Introduction

Satureja montana L. (winter savory or mountain savory) is a perennial species, native to the Mediterranean Basin, the Balkans and Asia Minor. It has been used for centuries in traditional medicine by the Balkan population to treat lymph nodes and inflammation of the respiratory system, possessing antimicrobial and antioxidant properties [15]. Natural antioxidants are much preferred over synthetic ones, especially those derived from plants, which are safer and more beneficial for human health [3].

Satureja hortensis L. (summer savory) annual species, native to North Africa, Southeastern Europe, the Middle East and Central Asia. The species can tolerate various climatic conditions. According to literature data, the extract of *S. hortensis* L. shows considerable biological potential in antioxidant, cytotoxic and antibacterial tests [13], contains minerals and vitamins. *S. hortensis* L. has important biological properties, including antimicrobial [4], antiviral [1] and antioxidant activity, as well as protective effects against cancer, infections, cardiovascular diseases, diabetes [2] and high cholesterol. The leaves and stems of this plant are used in the food, fodder [5] and pharmacological industries due to their antioxidant properties and substantial nutritional content [2]. *S. hortensis* L. is used quite frequently and widely both as a food spice and as a medicinal remedy that is quite beneficial for human health due to its unique properties.

Thymus vulgaris L. (garden thyme) is a perennial species, native to the Mediterranean Basin, used in the food [16], pharmaceutical and cosmetic industries [11]. The biochemical research has shown that *T. vulgaris* contains 56.53% monoterpenoids, 28.69% monoterpene hydrocarbons, 5.04% sesquiterpenes hydrocarbons and 1.84% oxygenated sesquiterpenes [16], the major terpenoids being linalool 48.19% and carvacrol 21.3% [19]. The essential oil and especially its main component – thymol [12] have obvious antiviral effects, being a disinfectant remedy for herpes [17].

The United States Environmental Protection Agency (EPA) has included thymol in the list of disinfectants with scientifically proven efficiency against COVID-19, recommended for disinfection of external hard surfaces and hands in medical, institutional or residential applications [20]. The active components of *T. vulgaris* have a number of medicinal, seasoning and cosmetic properties, which suggest the idea of large scale multiplication, cultivation and implementation of this crop [7].

Thymus × *citriodorus* (Pers.) Schreb. (lemon thyme) has increasingly gained popularity and is in great demand not only as an ornamental and honey plant [8], and as a medicinal remedy with unique curative properties [18], but also for its spice-aromatic properties, as in “Herbs de Provence”, widely used in Europe and Turkey [9].

The spasmolytic effect [10] and antimicrobial properties, attributed by terpenoids and flavonoids [14], have been scientifically proven. The antioxidant activity is due to phenols [15] and due to the content of rosmarinic acid. The essential oil has natural preservative properties, especially used in food, when preparing canned foods, marinades or desserts, to extend the shelf life of products.

Lemon thyme has many medicinal, seasoning and ornamental properties, which motivated us to select and identify new forms, better adapted to the climatic conditions of our country and with a narrower specialization of use, such as the seasoning - aromatic one.

2. Materials and Methods

The following taxa were taken as initial research material: *S. montana* L., *S. hortensis* L., *T. vulgaris* L., and *T.* × *citriodorus* (Pers.) Schreb., (a natural hybrid of *Thymus pulegioides* L. × *T. vulgaris* L.) introduced and studied over several years from various aspects. The clonal selection method was used to obtain new forms, of which two stood out – the *Satureja montana* variety 'Alfa 14' and the lemon thyme variety 'Lyli-roz', which have high productivity of raw material and essential oil, and were registered as varieties. Also, through the selection method, a new form of *T. vulgaris* with a high content of essential oil was obtained. The new forms are much more resistant to harsh winter conditions, eliminating the need to protect (cover) the plants during the cold season of the year, and being less vulnerable to the prolonged lack of precipitation, which has become increasingly common in recent years. For the *S. hortensis* L. species, being an annual species, forms were chosen that are earlier in terms of the duration of the growing season until the seeds ripen and resistant to low humidity conditions. The thyme and savory varieties were tested according to the requirements set for plant varieties, namely, agronomic values and distinctness, uniformity and stability.

3. Results and Discussions

Over the course of several years (over 8 years), thyme species have been studied and analyzed primarily for morphological characters, which constitute elements of the production of the plants. Thus, the height of *S. montana* L. plants, according to multiannual data, was 78.6 cm (table 1), being the tallest among the studied varieties. *S. montana* L. – mountain savory reached on average 64.8 cm in height, this character being greatly influenced by meteorological conditions and the fact that the species is annual and humidity conditions can even determine the survival of the plant.

As for the two varieties of *T. vulgaris* L., they reached 66.5 and 26.4 cm in height, respectively. The plant diameter was also larger in *S. montana* L. (85.3 cm), but in *T.*

vulgaris L. and *T.* × *citriodorus* (Pers.) Schreb. it was practically equal to 66.5 and 64.8 cm, which have many branches that grow in horizontal direction. *S. hortensis* L. is a unitary plant with well-determined, upright stems, the bush being quite compact, the diameter is only 44.8 cm.

The bushes of the studied thyme varieties are represented by multiple stems erect in the center and arched towards the edges. They give the bush a hemispherical or even spherical shape, depending on the variety. The number of leafy branches, especially annual shoots with multiple branches, constitutes the main part of the raw material production.

In *S. montana* L. they constituted 465 units, in *T. vulgaris* L. - 317 and *T.* × *citriodorus* (Pers.) Schreb. - 447 units. *S. hortensis* L. was the least branched, developing only 22 branches (Table 1). The oil glands, in the studied thyme and savory varieties, are located on the convex edge of the leaves, which are small in size.

The leaves of the three perennial taxa *S. montana* L., *T. vulgaris* L. and *T.* × *citriodorus* (Pers.) Schreb. are preserved during the winter, making the species valuable for landscape architecture. Having well-developed roots, all the studied thyme and savory varieties have the ability to reduce soil erosion, being very useful in this regard for a large part of the agricultural land in the Republic of Moldova.

Table 1. Morphometric parameters of the thyme and savory varieties studied in the collection of IGPPP of MSU.

Species name	Parameters	Plant height, cm	Bush diameter, cm	Shoots per plant, nr.	Inflorescence length, cm.	Flower stalks per plant, nr.
S. montana L.	X	78.6	85.3	465.4	23.6	456.3
	Sx	1.12	3.12	6.1	1.0	5.8
S. hortensis L.	X	64.8	44.8	22.4	2.4	20.6
	Sx	1.45	3.08	1.34	1.1	1.1
T. vulgaris L.	X	38.8	66.5	317.3	2.2	309.2
	Sx	1.23	3.12	5.8	1.0	5.3
T. × *citriodorus* (Pers.) Schreb.	X	26.4	64.8	447.3	2.4	432.4
	Sx	1.45	3.08	6.7	1.1	6.4

The flowers of all the studied varieties are structurally the same, because they all belong to the *Lamiaceae* family – small, grouped in half-whorls of 3-5-7 flowers located in the axil of the leaves, in the upper part of the annual shoots. The corolla of the flower in *S. montana* L. is white with pink shades, in *S. hortensis* L., *T. vulgaris* L. it is pale purple,

and in *T.* × *citriodorus* (Pers.) Schreb. – bright pink. Oil glands are also located on the corolla, calyx and bracts. The number of days until the harvest of aerial parts constitutes the duration of the growing season until the harvest, which in *S. montana* L. was from 123 to 144 days, in different years, until the harvest of the raw material, which is carried out in the full flowering phase, when the plant accumulates the largest amount of essential oil. In *S. hortensis* L. this period lasted 104-116 days. The shortest period until harvest was for *T. vulgaris* L. – 75-84 days and for *T.* × *citriodorus* (Pers.) Schreb. this period lasted 71-85 days, which allows a staggered harvesting of thyme and savory crops, especially under the conditions of industrial plantations.

After the production of fresh raw material, mountain thyme – *S. montana* L. is the most productive, accumulating 6.7-7.6 t/ha, from which 40.6-44.1 kg/ha of essential oil and 1.5-1.8 t/ha of dry raw material (pharmaceutical herba) were obtained, used for pharmaceutical, cosmetic and other utilities (Table 2). *S. hortensis* L. achieved lower fresh raw material production, of 0.98-7.5 t/ha, from which 0.2-0.4 t/ha dry matter and 14.3-16.3 kg/ha of essential oil were obtained – all products being used mainly in the food industry.

T. vulgaris L. and *T.* × *citriodorus* (Pers.) Schreb. produced about 4.3-6.0 t/ha fresh raw material and 13.9-21.1 kg essential oil, which are used in the pharmaceutical industry, perfumery and cosmetology.

Table 2. Average values for the production of raw material and essential oil obtained from thyme and savory varieties from the collection of IGPPP of MSU.

Species name	Days until harvesting	Raw material productivity		
		fresh, t/ha	dry, t/ha	Essential oil, kg/ha
S. montana L.	123-144	6.7-7.6	3.2 -3.4	40.6-44.1
S. hortensis L.	104-116	0.98-7.5	0.2-0.4	14.3-16.3
T. vulgaris L.	75-84	2.0-3.5	0.6-0.9	10.4-15.2
T. × *citriodorus* (Pers.) Schreb.	71-85	4.3-6.0	1.5-2.0	13.9- 21.1
DL_{05}	-	0.42	0.06	1.41

The production of fresh raw material from *T.* × *citriodorus* (Pers.) Schreb. was 4.3-6.0 t/ha, 1.5-2.0 t/ha dry matter and 13.9-21.1 kg/ha of essential oil with wide use in the food and pharmaceutical industries, perfumery, cosmetology and landscape architecture.

S. montana L. is a predominantly self-pollinating species and can be propagated by seeds. Flowering begins in July and lasts until September. The seed maturation is staggered and lasts over 154 days (Table 3). Seed production is low, and the germination capacity is 40-42% under laboratory conditions. In the second year of storage, the seeds of *S. montana* L. increase their germination capacity up to 60%, due to the full completion of physiological processes. *S. montana* L. seeds maintain their germination capacity for 3-4 years.

In *S. hortensis* L., the duration of the growing season until seed ripening was 122 days, during which 97 to 103 kg/ha of seeds are obtained, with a germination capacity of 87-90%, corresponding to class I in quality, maintaining good germination over 5-7 years. The seeds that are shed in the field during harvesting germinate spontaneously the following year, under conditions of sufficient humidity. *T. vulgaris* L. has a growing season until seed ripening of 92 days, being the earliest variety, but it also forms few seeds with a germination capacity of only 34-45%. The fruits are small, brown, round-ovate nutlets. The weight of 1000 seeds in the 3 studied varieties varied from 0.22 to 0.40 g. The variety *T.* × *citriodorus* (Pers.) Schreb. is a sterile hybrid and does not produce seeds.

Table 3. Average seed production of thyme and savory varieties on the collection of the IGPPP of MSU (starting with the third year of plant development).

Species name	Days until harvesting, nr.	Production of:		
		seeds, kg/ha	Weight of 1000 seeds, g	Germination capacity, %
S. montana L.	154	34-37	0.22-0.24	40-42
S. hortensis L.	122	97-103	0.38-0.40	87-90
T. vulgaris L.	92	32-34	0.28-0.30	34-45
T. × *citriodorus* (Pers.) Schreb.	Practically does not produce seeds, vegetative propagation			

During the research, various methods of propagating thyme and savory varieties grown in the collection of IGPPP of MSU were tested. Thus, the species *S. montana* L. can be propagated by sowing directly in the field, in late autumn, just before the beginning of winter, using 3-4 kg/ha of seeds or by seedlings and by preventively rooted cuttings. *S. hortensis* L. is also propagated by direct sowing in open ground using 4.5-5 kg/ha or by seedlings – on small areas.

(a) (b) (c) (d)

Figure 1. (a) *S. montana* L., (b) *S. hortensis* L. (c) *T. vulgaris* L. (d) *T.* × *citriodorus* Pers.

T. vulgaris L. also has two methods of propagation: by seedlings obtained from seeds and vegetatively – by rooted cuttings. *T.* × *citriodorus* (Pers.) Schreb., being a very polymorphic species, requires only vegetative propagation to maintain the obtained characters. For the perennial varieties studied, propagation by dividing the mother plants, obtained from already existing plantations, is also possible.

Two more varieties of thyme have been added to the collection of IGPPP of MSU for introduction and study – *T. longicaulis* C. Presl and *T. comosus* Heff., which are small species with spreading habit and abundant flowering, growing as ground cover, the most efficient uses of which will be determined after multiplication and further multilateral study.

Figure 1 shows the four varieties of thyme and savory studied in the collection of IGPPP of MSU.

4. Conclusions

As a result of the research conducted over several years, a variety of savory was submitted to the State Commission for Plant Variety Testing and registered – *Satureja montana* L. variety 'Alfa-14', with high biological potential, obtaining raw material production of 6.7–7.6 t/ha, essential oil 40.6-44.1 kg/ha and seeds 34-37 kg/ha within 8 years.

S. hortensis L., due to its chemical components, especially its essential oil, is an indispensable species as a culinary spice, in the preparation of canned foods and in everyday cooking, but it is also used as a medicinal plant – as an adjuvant in the treatment of respiratory diseases and colds.

Another registered variety – *T.* × *citriodorus* 'Lily-roz', also created at IGPPP of MSU, is capable of achieving high yields – 4.3-6.0 t/ha of plant raw material for fresh and dried consumption used in the production of herbal teas, and 13.9-21.1 kg/ha of essential oil for pharmaceutical and perfumery extracts.

T. vulgaris L., selected and tested in our study, has high productivity of essential oil – 10-15 kg/ha, possessing strong intestinal antiseptic, carminative, choleretic, diuretic, expectorant and sedative properties. It is a very good variety for landscape design.

References

[1] ABAD, M. J., BERMEJO, P., GONZALES, E., IGLESIAS, I., IRURZUN, A., CARRASCO, L. Antiviral activity of Bolivian plant extracts. *General Pharmacol. Vasc. Syst.*, 1999, vol. 32, pp. 499–503. DOI: 10.1016/s0306-3623(98)00214-6

[2] ABDOLLAHI, M., SALEHNIA, A., MORTAZAVI, S. H., EBRAHIMI, M., SHAFIEE, A., FOULADIAN, F. Antioxidant, antidiabetic, antihyperlipidemic, reproduction stimulatory properties and safety of essential oil of *Satureja khuzestanica* in rat *in vivo*: A oxicopharmacological study. *Med. Sci. Monit. Int. Med. J. Exp. Clin. Res.*, 2003, vol. 9, pp. BR331–BR335. PMID: 12960922

[3] AĆIMOVIĆ, M., ŠOVLJANSKI, O., PEZO, L., TRAVIČIĆ, V., TOMIĆ, A., ZHELJAZKOV, V. D., ĆETKOVIĆ, G., ŠVARC-GAJIĆ, J., BREZO-BORJAN, T., SOFRENIĆ, I. Variability in biological activities of *Satureja montana* subsp. *montana* and subsp. *variegata* based on different extraction methods. *Antibiotics (Basel)*, 2022, vol. 11, no. 9, pp. 2–19. DOI: 10.3390/antibiotics11091235, PMID: 36140014

[4] ADIGUZEL, A., OZER, H., KILIC, H., CETIN, B. Screening of antimicrobial activity of essential oil and methanol extract of *Satureja hortensis* on foodborne bacteria and fungi. *Czech J. Food Sci.*, 2007, vol. 25, pp. 81–89. DOI: 10.17221/753-cjfs

[5] ALIZADEH, A., KHOSHKHUI, M., JAVIDNIA, K., FIRUZI, O., TAFAZOLI, E., KHALIGHI, A. Effects of fertilizer on yield, essential oil composition, total phenolic content and antioxidant activity in *Satureja hortensis* L. (Lamiaceae) cultivated in Iran. *J. Med. Plants Res.*, 2010, vol. 4, pp. 33–40. DOI: 10.5897/JMPR09.361

[6] ALMANEA, A., EL-AZIZ, G. S. A., AHMED, M. M. M. The potential gastrointestinal health benefits of *Thymus vulgaris* essential oil: A review. *Biomed. Pharmacol. J.*, 2019, vol. 12, pp. 1793–1799. DOI: 10.13005/bpj/1810

[7] АЛЬ КАРАВИ, Х; Особенности накопления фармакологически значимых соединений в представителях рода Тимьян (Thymus L.) В сб. конференции «Новые и нетрадиционные растения и перспективы их использования», Материалы XI международного симпозиума.15-19 июня 2015 года. Пущино. М.: 2015. с. 51-53.

[8] ANTONIE, I. The biodiversity of the melliferous plants in the surroundings of the town Sebeş (Alba County) and their economical importance. *Economic Engineering in Agriculture and Rural Development, Series Management*, 2014, vol. 14, no. 4, pp. 13–18.

[9] BAGDAT, R. Quality parameters of *Thymus citriodorus* (Pers.) Schreb. (synonym *T. fragrantissimus*, *T. serpyllum citratus*, *T. serpyllum citriodorum*) cultivated under Ankara ecological conditions. 59th International Congress of GA. *Planta Med.*, 2011, vol. 77, pp. 1229–1472.

[10] BROUCKE, C. et all.; Spasmolytic activity of the flavonoids from *Thymus vulgaris*. *Pharmaceutics Weekblad.*, 1983. vol. 5, no. 1., pp. 9–14.

[11] DALAL, Hammoudi Halat; MAHA, Krayem; SANAA, Khaled; SAMAR, Younes. A focused insight into thyme: biological, chemical, and therapeutic properties of an indigenous Mediterranean herb. *Journal Nutrients*, 2022, vol. 14, no. 10, pp. 2–22. doi: 10.3390/nu14102104

[12] DAUQAN, E.M.A., ABDULLAH, A. Medicinal and functional values of thyme (Thymus vulgaris L.) herb. *Journal of Applied Biology and Biotechnology*, 2017, vol. 5, no. 2, pp. 17–22. doi: 10.7324/JABB.2017.50203

[13] FATHI, R., MOHEBODINI, M., CHAMANI, E. Evaluation of genetic diversity of summer savory (Satureja hortensis L.) accessions based on morphological and phytochemical characteristics. *Iranian Journal of Medicinal and Aromatic Plants Research*, 2021, vol. 36, no. 6, pp. 1005–1021. doi: 10.22092/ijmapr.2021.342246.2742

[14] HORIKRRISHA, D. et al. Pharmacological investigation of flavonoid glucoside. *Indian Journal of Pharmacology*, 2004, vol. 36, pp. 244–250.

[15] KREMER, D., KOSIR, I.J., KONČIĆ, M.Z., CERENAK, A. Antimicrobial and antioxidant properties of *Satureja montana* L. and *S. subspicata* Vis. (Lamiaceae). *Current Drug Targets*, 2015, vol. 16, no. 14, pp. 1622–1633. doi: 10.2174/1389450116666150202161926

[16] MARHAMATIZADEH, M., GOOSHEH, S. The combined effect of *Thymus vulgaris* extract and probiotic bacteria (*Lactobacillus acidophilus* and *Bifidobacterium bifidum*) on aflatoxin M1 concentration in kefir beverage. *Italian Journal of Food Science*, 2016, vol. 28, no. 3, pp. 517–524.

[17] NOLKEMPER, S., REICHLING, J., STINTZING, F.C., CARLE, R., SCHNITZLER, P. Antiviral effect of aqueous extracts from species of the Lamiaceae family against herpes simplex virus type 1 and type 2 in vitro. *Planta Medica*, 2006, vol. 72, pp. 1378–1382. doi: 10.1055/s-2006-951719

[18] OMIDBAIGI, R. et al. Essential oil content and constituents of *Thymus* × *citriodorus* L. at different phenological stages. *Journal of Essential Oil-Bearing Plants*, 2000; vol. 12, no. 3, pp. 333–337.

[19] PALMIERI, S., PELLEGRINI, M., RICCI, A., COMPAGNONE, D., LO STERZO, C. Chemical composition and antioxidant activity of thyme, hemp and coriander extracts: a comparison study of maceration, Soxhlet, UAE and RSLDE techniques. *Foods*, 2020, vol. 9, no. 9, 1221, pp. 1–18. doi: 10.3390/foods9091221

[20] United States Environment Protection Agency. About List N: Disinfectants for Coronavirus (COVID-19). [Accessed on 5 March 2022]. Available online: `https://www.epa.gov/coronavirus/about-list-n-disinfectants-coronavirus-covid-19-0-13`

[21] WAEL, Toaima; EMAD, Saleh Hamed; WAFAA Hamed. Evaluation of savory (*Satureja hortensis* L.) under organic farming system. *Journal of Medicinal Plants Studies*, 2023, vol. 11, no. 2, pp. 50–57. doi: 10.22271/plants.2023.v11.i2a.1540

Received: April 23, 2025 *Accepted: July 16, 2025*

(Lilia Chisnicean, Zinaida Vornicu, Tamara Jelezneac) Institute of Genetics, Physiology and Plant Protection of Moldova State University, Chisinau

E-mail address: `lilia.chisnicean@sti.usm.md, zinaida.vornicu@sti.usm.md, tamara.jelezneac@sti.usm.md`