CORRELATION BETWEEN FRESH MASS AND DRY MASS OF SOME MEDICINAL AND AROMATIC PLANT SPECIES GROWN ON SANDY SOILS

Milica DIMA [1], Aurelia DIACONU [1], Reta DRĂGHICI [1], Irina TITIRICĂ [1], Alina PARASCHIV [1], Florentina NETCU [1]

(1) Research and Development Station for Plant Culture on Sands Dabuleni, 217 Petre Banita street, Dabuleni, Romania
author email: milicadima@yahoo.com
Corresponding author email: retadraghici@yahoo.com

Abstract

From the old times the phytotherapy help in ameliorating and treating of some ailments, this had highlith some medicinal and aromatic plants species to beeing cultivated to more areas. In Romania, more than 300 medicinal and aromatic plant species are known, the purpose of research from the RDSPCS Dabuleni being to the promotion of some medicinal and aromatic plants species on sandy soils. So, the folllowin medicinal and aromatic species with therapeutic value was studied: Salvia officinalis, Lavandula angustifolia, Calendula officinalis, Hyssopus officinalis. Salvia officinalis due to its rich vitamin content, is considered a miraculous plant with healing properties. Lavandula angustifolia is used in natural medicine for various teas, oils and tinctures, but also in the cosmetic industry for perfumes, soaps and body lotions. Calendula officinalis is cultivated for its flowers due to its antiinflammatory, antiseptic, antimicrobial action. Hyssopus officinalis is a very precious plant for health due to the volatile oils and flavonoids in its composition.

These species are studied to profitably capitalize on the ecopedological conditions specific to sandy soils in terms of production capacities and the active principles they contain compared to the forms existing in other areas of the country. Thus, during the study period, Salvia officinalis has registerred the highest yield of 14052 kg/ha fresh herb compared to the other studied species, with a dry yield of 4:1.

Key words*: sandy soils, medicinal and aromatic plants , herba, production*

INTRODUCTION

The introduction of medicinal and aromatic plants in the structure of crops on sandy soils was aimed at identifying new species of medicinal and aromatic plants with high adaptability to thermal and water stress factors, capable of exploiting the poorest sandy soils, detecting some plant species of medicinal and aromatic plants that ensure a high degree of vegetation coverage in order to fix sandy soils and reduce deflation. In this sense, some medicinal and aromatic slopes are an alternative for capitalizing on the favorable conditions demanded by the natural endowment of the sandy soils in the south of Oltenia.

The research carried out in the field of medicinal and aromatic plants shows that they are a precious treasure endowed by nature, at first used empirically, then based on research, to prevent and cure some ailments. (Constantinescu, D.Gr., Bojor, O. 1969)

Current guidelines in medicine are increasingly focused on the use of phytotherapy (treatment with drugs obtained from plants), limiting the use of synthetic drugs. In modern times, phytotherapy and research in this sense

have experienced a new development (Păun and Mihalea, 1981).
Due to the very varied climate and soil conditions, our country has a diverse and rich flora. To improve production and its quality, studies were carried out at the Agricultural University of Cluj Napoca (Muntean, L.S., 2007; Nell, M. et al., 2009). Medicinal plants are effective sources of flavonoids, tannins, glycosides, antimicrobial and antioxidant products (Calixto, B.J., 2000.). They are also an important source of beneficial substances for the body, being used as therapeutic remedies for various diseases(Duke, J.A. et al., 2002). A number of remedies are obtained from various species (Miliauskas, G. et al., 2004) used for external treatment (Barrett, B. 2003; Pramod K. et al., 2009).
Medicinal and aromatic plants are intensively explored for their potential use as allelopathically active crops. The inclusion of species with allelopathic activity in crop rotation, intercropping or mulching systems can have benefits for crop management (Bonea, 2020). Previous studies have shown that aqueous extracts of basil and sage in low concentrations showed a stimulatory effect on root and shoot elongation in maize seedlings (Bonea, 2018; Bonea, 2020).
In our country, there have been concerns related to the culture of medicinal and aromatic plants since the beginning of this century. The first experimental station specialized in the study of medicinal plants was in Cluj Napoca in 1904, thus laying the foundations for research in the field of medicinal and aromatic plants from our flora. At the Research and Development Station for Plant Culture on Sands from Dabuleni, the first research on the behaviour of some species of medicinal and aromatic plants began in 1981 when 10 species were studied. Over time, the assortment was improved so that it reached over 50 species.
The researches from RDSPCS Dabuleni aimed to promote on sandy soils some species of medicinal and aromatic plants that profitably capitalize on the specific ecopedological conditions, not only through the high production capacity but also through the active principles they contain compared to the forms existing in other areas of the country.

MATERIAL AND METHOD

At RDSPCS Dabuleni, in the period 2019-2022, research was initiated regarding:
- the identification of some species of medicinal and aromatic plants with high adaptability to thermal and water stress factors capable of exploiting the poorest sandy soils;
- finding some species of medicinal and aromatic plants that ensure a high degree of vegetation cover in order to fix sandy soils and reduce wind deflation.

Among the medicinal and aromatic plant species found in the Dăbuleni collection, the following were studied: *Salvia officinalis, Lavandula angustifolia, Calendula officinalis* and *Hyssopus officinalis.*
The method of establishing the culture was different according to the species: *Hyssopus officinalis*, *Salvia officinalis* and *Calendula officinalis* were established by seedlings produced in sockets and planted in spring, in May, and for *Lavandula angustifolia* the rooted cuttings were planted in autumn in October.
The space of plant nutrition was different by species:
- for *Hyssopus officinalis,* the distance between rows was 70 cm and 25 cm between plants per row;
- for *Calendula officinalis*, the distance between rows was 70 cm and 20 cm between plants per row;
- for *Salvia officinalis*, the distance between rows was 70 cm and 30 cm between plants per row;
- for *Lavandula angustifolia*, the distance between rows was 100 cm and 40 cm between plants per row.

Herbs were harvested from *Hyssopus officinalis* and *Salvia officinalis* and flowers were harvested from *Calendula officinalis* and *Lavandula angustifolia*. They were weighed fresh and then dried. The ratio of fresh mass to dry mass was determined.

Table 1. The species of medicinal studied

The species	The era of the establishment of the culture	The epoch of the establishment of the culture	The nutrition space	The harvested part
Hyssopus officinalis	Seedling	May	70/25	Herba
Calendula officinalis	Seedling	May	70/20	Flowers
Salvia officinalis	Seedling	May	70/30	Herba
Lavandula angustifolia	Rooted cuttings	October	100/30	Flowers

Pharmacological studies have shown that *Hyssopus officinalis*(Figure 1) is a very valuable plant for health due to the volatile oils and flavonoids in its composition (pinene, pinocamphen, diosmin). The plant is part of antiasthmatic teas and is a good antispasmodic, carminative, anti-inflammatory and tonic (due to the tannins and marubiin it contains).

Figure 1. *Hyssopus officinalis*

The herb was harvested from the hyssop, during the flowering period, without the woody parts of the stem, respectively the portion with inflorescences. The plants were cut about 10 cm from the ground with a sickle. Two harvests were made, the first in June and the second in September. After harvesting, the lignified stems were removed and then it was dried in the shade, in a thin layer. The drying yield was approx. 4:1. The average production of the fresh herb was 3253 kg/ha respectively 822 kg/ha dry raw material(Table 2). The analysis of the functional link between the fresh weight and the dry weight determined in the hyssop (Figure 2), highlighted a positive, distinctly significant correlation (r=0.99**).

Table 2. The production of herb obtained from *Hyssopus officinalis*

The species	Repetiţion	The production green herba(kg/ha)	The production dry herba (kg/ha)	The ratio of fresh mass to dry mass
Hyssopus officinalis	R1	2353	590	4:1
	R2	2830	744	3,8:1
	R3	3263	820	4:1
	R4	3348	830	4:1
	R5	4469	1125	4:1
	Media	3253	822	4:1

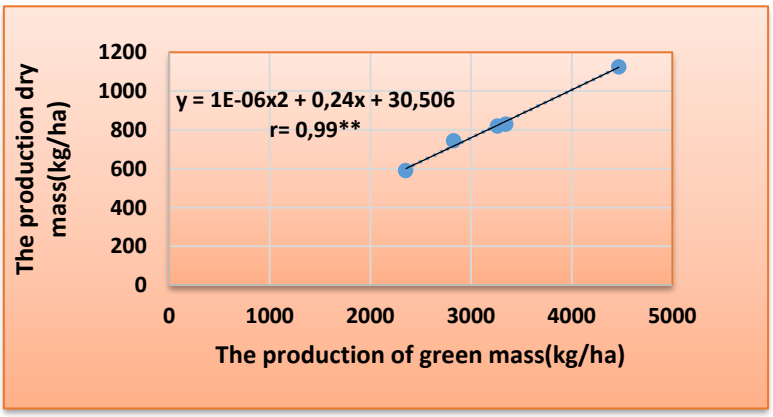

Figura 2. Correlation between fresh mass and dry mass production in *Hyssopus officinalis*

Lavandula angustifolia (Figure 3) is used in natural medicine for various teas, oils and tinctures, but also in the cosmetic industry for perfumes, soaps and body lotions. Lavender tea helps to maintain the health of the skin, reduces mental tension and gives a state of peace, treats insomnia. Lavender oil useful both for relaxation, calming and removing stress and anxiety, in cosmetics, for skin and hair, being a powerful anti-inflammatory, cicatrizing and moisturizing. It is also used in aromatherapy, having a strong effect on the nervous system and being recommended for insomnia and apnea.

Figure 3. *Lavandula angustifolia*

The average production of fresh flowers was 2576 kg/ha respectively 403 kg/ha of dry raw material, with a drying yield of 6.4:1.The correlation coefficient between fresh mass production and dry mass production for *Lavandula angustifolia* was r = 0.95* (Figure 4). Comparing this value

with the correlation coefficient at the probability of 5%, it can be said that between the production of fresh and dry mass the correlation coefficient is very significantly positive.

Table 3. The production of herbs obtained from *Lavandula angustifolia*

The species	Repetiție	The production green herba(kg/ha)	The production dry herba (kg/ha)	The ratio of fresh mass to dry mass
Lavandula angustifolia	R1	2260	380	6:1
	R2	2730	420	6,5:1
	R3	2470	400	6,2:1
	R4	2800	410	7:1
	R5	2620	405	6,5:1
	Media	2576	403	6,4:1

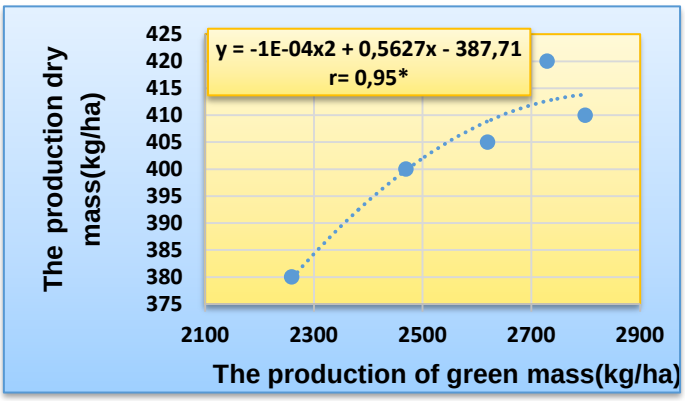

Figure 4. Correlation between fresh mass and dry mass production in *Lavandula angustifolia*

Calendula officinalis (Figure 5) is cultivated for its flowers due to its stimulating action, speeding up the wound healing process (Muntean, L.S., 2007).

Marigolds contain flavonoids, carotenoids, vitamin C, essential oils and bitter substances. They have anti-inflammatory, decongestant, antiseptic, antimicrobial, immunostimulant and healing, accelerate healing and tissue regeneration, regulate biliary function through bitter principles.

Figure 5. *Calendula officinalis*

Table 4. Flower production obtained in *Calendula officinalis*

The species	Repetiție	The production green herba(kg/ha)	The production dry herba (kg/ha)	The ratio of fresh mass to dry mass
Calendula officinalis	R1	4730	727	6,5:1
	R2	4200	685	6,1:1
	R3	4570	703	6,5:1
	R4	4410	700	6,3:1
	R5	4330	676	6,4:1
	Media	4448	698	6,4:1

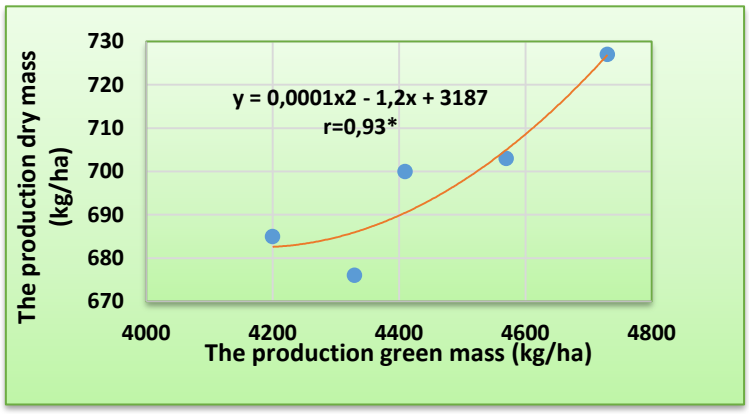

Figure 6. Correlation between fresh mass and dry mass production in *Calendula officinalis*

In the case of the *Calendula officinalis* species, the average fresh flower production was 4448 kg/ha, and the dry yield showed an average ratio of 6.4:1 (Table 4). The statistical analysis of the obtained results highlighted the significant positive correlation between fresh mass and dry mass (r = 0.93*), which shows the increase in the amount of dry mass with the increase in green mass production (Figure 6).

Due to its rich vitamin content, *Salvia officinalis* is considered a miraculous plant with healing properties. Sage leaves contain vitamins (A, B, C) and minerals (calcium, potassium, magnesium, iron, zinc and sodium). Sage oil is used for dental hygiene (Maria Verzea, 2001), improves blood circulation and fights infections and microbes. Sage tea helps the normal functioning of the digestive system, eliminates gastrointestinal spasms and bloating and protects the nervous system (Figure 7)

Figure 7. *Salvia officinalis*

Table 5. The production of herb obtained from *Salvia officinalis*

The species	Repetiție	The production green herba(kg/ha)	The production dry herba (kg/ha)	The ratio of fresh mass to dry mass
Salvia officinalis	R1	14350	3500	4:1
	R2	13720	3430	4:1
	R3	14390	3597	4:1
	R4	15070	3585	4,2:1
	R5	12950	3405	3,8:1
	Media	14096	3503	4:1

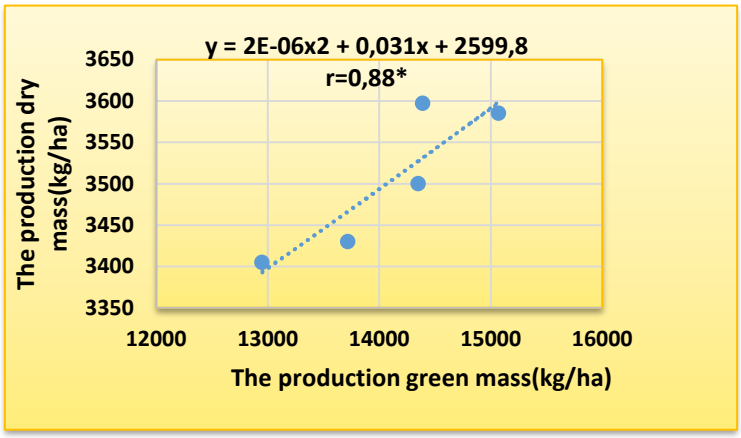

Figure 8. Correlation between fresh mass and dry mass production in *Salvia officinalis*

Salvia officinalis is a species that achieved an average herb production of 14096 kg/ha with a drying yield of 4:1 (Table 5). The statistical analysis between the yield of fresh and dry matter of *Salvia officinalis* (Figure 8) revealed a linear correlation with a correlation coefficient statistically assured as significant (r = 0.88*).

CONCLUSIONS

Through the cultivation of medicinal plants, some less productive lands, such as sandy soils, can be used.

From the collection of medicinal and aromatic plant species existing at RDSPCS Dabuleni, four species were identified (*Lavandula angustifolia, Calendula officinalis, Hysophus officinalis, Salvia officinalis*) which had a high adaptability to water and thermal stress factors from the area of sandy soils.

The results obtained showed an average production of flowers of 2576 kg/ha for *Lavandula angustifolia* and of 4448 kg/ha for *Calendula officinalis*, a production of 3253 kg/ha consisting of herba + flowers for *Hysophus officinalis* and an average production herba of 14096 kg/ha, in *Salvia officinalis*.

Positive correlations were established between fresh mass and dry mass with statistically significant assurance in *Lavandula angustifolia* (r = 0.95*), *Calendula officinalis* (r = 0.93*), and *Salvia officinalis* (r = 0.88*) and distinctly significant in *Hysophus officinalis* (r=0.99**).

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