THE INVESTIGATION OF A SPICE AND HERB'S NUTRIENT REQUIREMENTS

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Abstract

During our research we investigated the summer savory 's (Satureja hortensis L.) herbadrug yield under different fertilization settings in small-plot trial. We measured the drug yield, which we harvested in 2015, 2016 and 2017 and we investigated the relationship between the changes of the herbadrug yield and the temperature. We dried the harvested herba under prenumbra for three weeks in 2015, but because of the wet weather and the elongate drying time, form 2016 we used drying cabinet 40 ^{o}C for 12 hours. We stored the dried and crumbled savory herba drug in paper bags.

Based on the data, the fertilization settings has a negative effect on the drug yield.

We made Pearson's correlation test to investigate the connection between the quantity of the raw herba, the different nutrient settings, and the average temperature of weeks prior to harvest. During processing of the gained data, Pearson's correlation test were applied by using MS Excel 2010 and IBM SPSS 22.0 programmes.

Key words: herb, spice, nutrient supply, summer savory

INTRODUCTION

The plants and their healing capabilities are here and were in the medicine, meal, science, and cosmetology. The interest is growing and growing after the medicinal plants' production and using. The phytotherapy is getting more emphasis in traditional medicine (Nagy, 1994). The use and the cultivation of herbs in the XXIth Century is a re-discovered research field. There is an increasing need to develop modern, species and variety specific methods of nutrient supply that ensure profitable yields and in the same time the growers must follow the directives of the European Union about quality assurance and environmental protection (Zámboriné et al, 2010). One of the medicinal plants' growing problems is, there are many uncertainties in the herbs specific nutrient requirements (Valkovszki, 2011). Herb's cultivation contains different species with different nutrient requirements. The herbs are not undemanding, this statement is incorrect (Zámboriné, 2010).

In the hungarian national list of species there is only one savory species, which called the Budakalászi, and it was domesticated since 1959 (Nemzeti Élelmiszerlánc-Biztonsági Hivatal, 2014). The summer savory used in the food industry mainly as a spice for canned foods and liqueurs, or

as a dietetian spice, for people, who do not like pepper, or can not eat foods with it. Summer savory could be component of tea blends for low blood pressure, inflation, gripes, and sore troat in the traditional medicine (Bernáth, 2000; Takácsné, 2004; Makay, 1994).

The savory is not demanding for the forecrop, but needs perennial weed free place and must be avoid after itself for 2-3 years. Needs medium level of nutrients except the potassium needs more (Bernáth, 2013). It is not expedient dispatch the manure directly below, which is otherwise well utilized (Pepó, 1992).

Under our research we analysed the nutrient requirements and fertilizer reactions of the summer savory according to the change in the drug yield, as an effect of the different nutrient dosages.

MATERILAS AND METHODS

Our experiment for the summer savory (Satureja hortensis L.) research took place in the experiment site of the University of Debrecen, Institute of Crop Sciences.

Plot size was 8 m^2 and plots were arranged in 4 replicates in randomized blocks, with 6 different fertilizer treatment levels, in 4 rows with 40 cm row space. The fertilizer dosages of the experiment were spread manually.

The fertilizer doses were:

- N0P0K0 (control)
- N15P20K30
- N30P40K60
- N45P60K90
- N60P80K120
- N75P100K150 N%, P_2O_5%, K_2O%

We spread the fertilizer doses to the experimental place manually. Control plots did not get nutrition. The experimental place's soil is chernozem In the previous year, before our research could be planned, the regular annual nutrient dosages were spread on the land (First time in 2014 5th March, 48 kg/ha nitrogen, 66 kg/ha phosphorus (P_2O_5) és 88 kg/ha potassium (K_2O), second time 28th october 38 kg/ha nitrogen, 31 kg/ha phosphorus (P_2O_5), és 37 kg/ha potassium (K_2O) were spreaded in the same year.). The nutrient supply necessarily affected the savory drug yield.

The rainfall on the experimental area in 2015 from 1st January to 30th September was considerably less (286.2 mm) than the 30 year average

(445.8 mm). From January till the end of September the average temperature of each month were higher than the 30 year average**,** except April. In 2016 the rainfall from 1st January to 31th August was considerably more (574.9 mm) than the 30 year average. From the 1st January to 31th August in 2016, the measured monthly mean temperature was higher than the 30 year average.

In 2017 during the majority of the growing season the precipitation remained below the 30 year average. This was especially noticeable in May when it was more than 30 millimeters "missing" compared to the average precipitation. However, the monthly measured mean temperature exceeded the 30 year average, with the exception of January and April.

In 2015, sowing took place on the spot on 2nd April, in 2016 on 4th April, in 2017 on 12th April in 1 cm depth. The first emerged plants appeared in 2015 on 20th April, in 2016 17th April, in2017 2nd May. The first flowers were observed on 27th July in 2015, in 2016 on 4th July, in 2017 26th July.

We measured the savouries raw drug yield, which gathering was done manually between 12th and 17th August 2015, between 8th and 10th August 2016, and on 7th August 2017.

The drying of the savory herba in 2015 first happened in semi-shade, and it took an average of three weeks. Unfortunatelly, because of the rainy weather the drug got back wetted and we must make post-drying in drying cabinet 40 ^{o}C for 12 hours. In 2016 because of the rainy weather too we dried the savory yield in drying cabinet 40 ^{o}C for 17 hours and in 2017 also. We stored the dried and crumbled savory herba drug in paper bags.

During processing of the gained data, Pearson's correlation test were applied by using MS Excel 2010 and IBM SPSS 22.0 programmes.

RESULTS AND DISCUSSION

Fig. 1. shows the quantity of the summer savory raw drug yield depending on the nutrient supply in 2015. First time, the yield start to increase with the increasing nutrient setting. The biggest yield data we measured in the N30P40K60 settings. Than comes a relapse in the N45P60K90 fertilization settings. The drug yield increased again in the N60P80K120 settings and get the second biggest crop result. Finally we measured the least drug yield in the N75P100K150 fertilization setting.

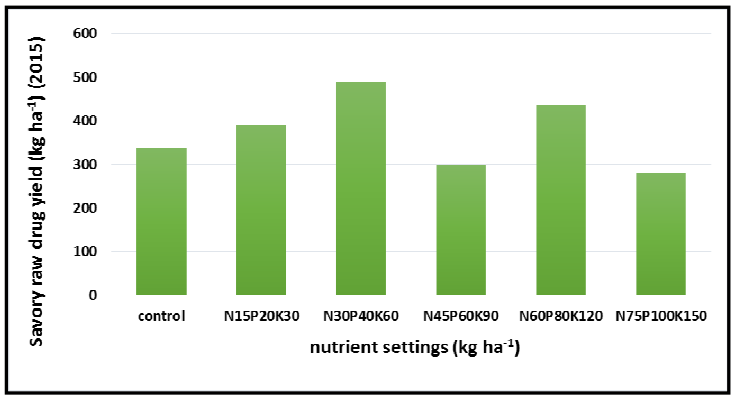

Fig. 1. Quantity of the savory raw drug yield depending on the nutrient supply in 2015 (Debrecen, 2015)

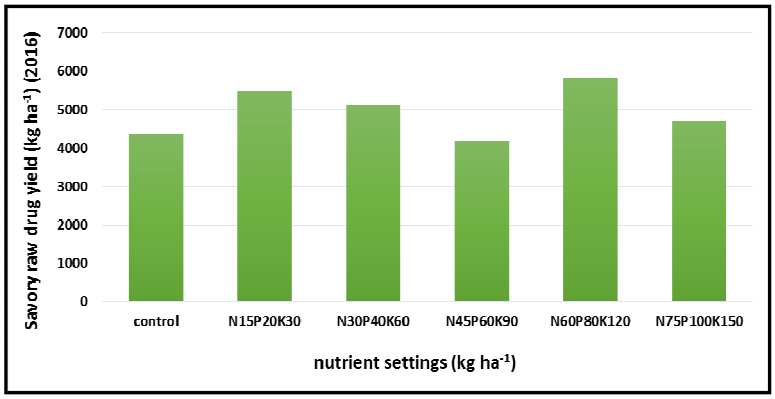

Fig. 2. Quantity of the savory raw drug yield depending on the nutrient supply in 2016 (Debrecen, 2016)

Fig. 2. shows the quantity of the summer savory raw drug yield depending on the nutrient supply in 2016. Similar to 2015, the yield start to increase with the nutrient settings, until the N30P40K60 setting. Contrary to

the year 2015's data, in 2016 the N60P80K120 has the biggest yield, but the three smallest we measured in the control, the N45P60K90, and the N75P100K150 settings.

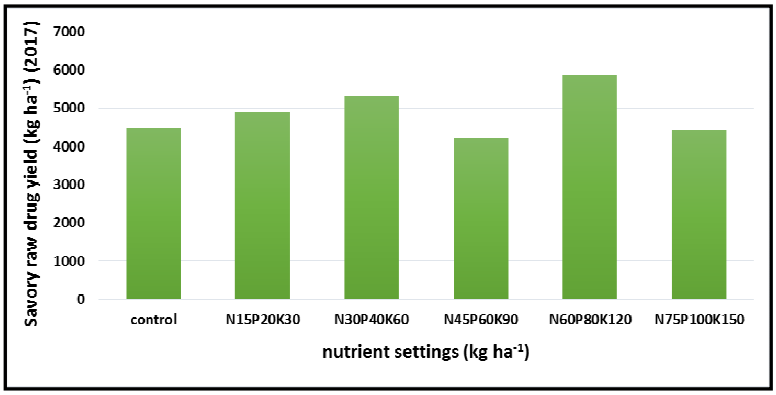

Fig. 3. Quantity of the savory raw drug yield depending on the nutrient supply in 2017 (Debrecen, 2017)

In 2017 just like in 2016 and 2015, the N60P80K120 and the N30P40K60 nutrient settings had the two biggest yields, and similarly the last two year, in the control, the N45P60K90, and the N75P100K150 groups was measured the lowest data (Fig. 3.).

Table 1

The summer savory's drug yield and 8 weeks before harvest average temperature's relationship with Pearson's correlation test (Debrecen, 2017)

	average temp. of 1 week before harvest	average temp. of 2 weeks before harvest	average temp. of 3 weeks before harvest	average temp. of 4 weeks before harvest	average temp. of 5 weeks before harvest	average temp. of 6 weeks before harvest	average temp. of 7 weeks before harvest	average temp. of 8 weeks before harvest
Summer savory drug yield	-,260*	-,211	-,393**	-,675**	-,678**	-,678**	-,332**	,220

*** significant at P=0,01 level, * significant at P=0,05 level*

We used Pearson's correlation test to investigate the connection between the quantity of the raw herba, the different nutrient settings, and the average temperature of weeks prior to harvest. We did not find relationship between the increasing nutrient settings and the raw drug yield of the summer savory. We found variable strength relationship between the amount of the drug yield and the pre-harvest weeks average temperature. From the third week before harvest to the seventh week we found increasing

than decreasing relationship at one percent significance level. On the third week we measured a negative medium correlation (r= -0.39, P=1%), which start to increase on the fourth week (r= -0.67, P=1%), and get the top in the fifth and sixth weeks (r= -0.68, P=1%), than it starts to decrease on the seventh week (r= -0.33, P=1%) (Table 1).

CONCLUSIONS

As for the raw drug yield in every year, the N60P80K120, and the N30P40K60 nutrient settings were the most effectively. Based on the recorded yield data, the three most ineffectual groups were the control, the N45P60K90, and the N75P100K150. In our opinion the increasing nutrient supplies negatively affect the raw drug mass of the summer savory.

The Pearson's correlation test result show the pre-harvest average temperature can be more effective for the raw drug yield of the summer savory than the nutrient supply.

Acknowledgments

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