Scientific Papers. Series A. Agronomy, Vol. LVI, 2013
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

THE INFLUENCE OF SOIL TILLING SYSTEMS AND THE PRECULTURE PLANT ON THE SOYBEAN CULTURE PRODUCTION IN THE SOMEȘAN PLATEAU

Adrian Ioan POP, Teodor RUSU, Ileana BOGDAN, Paula MORARU

University of Agricultural Science and Veterinary Medicine Cluj-Napoca, 3-5, Calea Mănăștur, 400372, Cluj-Napoca, Romania

Corresponding author email: aipop21@yahoo.com

Abstract

The cultivated plant production is the result of the interaction of all factors which participate on way or another in the formation of the harvest. The level of harvest is proportional to the degree to which each factor and all of them together are getting close to the optimum values required by the biology of the plants, following that the soy production recorded in the experimental years in the Somesan Plateau is proportional to the soil tilling systems, the preculture plant and the climatic conditions. The analisys of soy productions by the soil tilling system and the preculture plant confirms the above mentioned, with larger productions with values between 1775 kg/ha and 1883 kg/ha after wheat preculture, and respectively 1467 kg/ha and 1757 kg/ha after corn preculture. The production differences determined by the preculture plant vary depending on the soil tilling system and have values between 5.8-21%. In the classic soil tilling system alternatives and the unconventional systems, the growth determined by the preculture plant is the smallest, with values between 6-7%, which means that their beneficial effect was taken over by the soil tilling, thus recording the largest productions, regardless of the precultures.In the harrow soil tilling system alternative, less favourable for the soy cultures, the harvest growth determined by the preculture plant reaches a maximum on experiment of 21.0%. A large increase determined by the preculture plant is also recorded in the chisel tilling alternative, in which the growth reaches 11.6%. From the above mention data analisys, it follows that when the soil tilling is favourable to the cultivated plant, the preculture plant`s contribution is less significant, and when the soil tilling doesn`t manage to favour the cultivated plant, we can suppose it`s the water factor in our situation. The preculture plant which ensures a larger period of time from harvesting to the soy culture sowing is more efficient concerning the level of production.

Key words: *soil tillage, production, crop rotation, soil fertility.*

INTRODUCTION

The production of each cultivated plant is the result of the interaction of all the factors which participate one way or another to the formation of the crop. The level of the crop is in direct connection to the degree in which every factor comes close to the optimum values required by the biology of the plant.

This global condition is rarely met in the natural life environment of the plants, but it can be improved by associating different practices: the way of preparing the soil, the sowing period, the density and the equipment used, the culture rotation, the soil or hybrid choice, the fertilizing and the application methods, control of the weeds, diseases and pests, so that the "offer of the place" is as close as possible to the biology of the cultivated plant.

To a large extent, the relationship between the soil tilling system and the production depends on the previous state of the soil and the precipitation level. The classical soil tilling system based on plowing with the mouldboard plough generally ensures the highest crops, exploiting however the natural fertility and exhausting the soil resources.

When elaborating the alternative soil tilling systems not only the immediate results (high productions) must be targeted, but also the long-term ones, which ensure the durability of the system in time.

The research conducted during more than fifty years of application confirms that the unconventional system ensures to the soy cultures productions which are close to those obtained in the classical system.

Synthetizing the data published in the specialist literature, comparatively between the two systems, classical and unconventional, similar levels of production emerge (Gus, 1995; Sandoiu, 1998; Lazureanu, 1997; Jitareanu, 2008).

MATERIALS AND METHODS

The results presented in this paper were obtained in the experimental fields of the agrotechnics discipline from the Jucu region in Cluj, on *argic-stagnic Faeoziom soil, with a humus content of* de 3.8% and 6.5 pH. From a climateric point of view, the hilly area where the experiments took place is characterised by medium annual precipitations between 550-650 mm. The thermal regime of the area is characterised by annual average temperatures between 8.0-8.2°C.

The aim of the research was to determine the influence of soil tilling systems and the pre-emerging plant on the soybean production.

The experimental factors were as follows:

Factor A – Tillage system:

- a_1 – worked with reversible plough
- a_2 – worked with chisel
- a_3 – worked with paraplow
- a_4 – worked with rotary harrow
- Factor B – Cultivated plant:
- b_1 – corn
- b_2 – soybean
- b_3 – wheat

RESULTS AND DISCUSSIONS

The soybean production analysis by the soil tilling system and the pre-emerging plant confirms the information mentioned (Table 1), with larger production, with values between 1775 kg/ha and 1883 kg/ha after wheat preculture and respectively 1467 kg/ha and 1757 kg/ha after corn preculture.

The production differences determined by the pre-emerging plant are different depending on the tillling system and have values between 5.8 -21%.

Table 1. Soybean production varying with the pre-emergent plant and the working system

Soil tillage system	Pre-emergent plant		Difference kg/ha
	Corn	Wheat	
	Soybean crop production, (kg/ha)		%
Reversible plough (a_1)	1757	1883	107.2
Chisel (a_2)	1613	1800	111.6
Paraplow (a_3)	1717	1817	105.8
Rotary harrow (a_4)	1467	1775	121.0

In the classical soil tilling alternatives (a_1) and unconventional ones (a_3), the increase determined by the pre-emerging plant is the smallest, with values between 6-7%, which means that its beneficial effect was overtaken by the soil tillage, thus obtaining the largest production regardless of the pre-emerging plant.

In the rotary harrow soil tilling alternatives, less favourable for the soybean culture, the harvest increase determined by the pre-emergent plant reaches a maximum on experience of 21.0%. Also, a high increase determined by the pre-emergent plant is recorded in the chisel tilling alternative, in which the increase reaches 11.6%.

From the analysis of the data mentioned (Table 1), it arises that when the soil tilling system is extremely favourable to the cultivated plant, the pre-emerging plant contribution is lower, and when the soil tilling system doesn`t manage to favour the cultivated plant, assuming the water factor in the Jucu situation, the pre-emerging plant which ensures a longer period of time from harvesting to the soybean culture sowing, is more effective regarding the production level.

Soybean crop production varying with the soil tillage system and the pre-emergent plant, wheat.

In the alternatives in which the pre-emerging plant was wheat, the soybean production recorded values from 1775 kg/ha to 1883 kg/ha. We can notice that the production differences determined by the soil tillage systems are blurred, so that, comparatively to the standard alternative, no production differences statistically ensured from other soil tilling methods are recorded.

Soybean crop production varying with the soil tillage system and the pre-emergent plant, corn

The recorded production was 1467-1757 kg/ha, reaching the maximum value in the reversible plough alternative, followed by the paraplow, chisel and rotary harrow alternatives. Distinct significant to negatively very significant differences can be noticed with the rotary harrow use and chisel use, and also insignificant differences in the situation of using the paraplow tilling system. This first observation leads to the idea that in the case of soybean cultures conditioned by the corn pre-

emerging plant, we recommend using the reversible plough, respectively the paraplow.

Table 2. Soybean crop production varying with the soil tillage system and the pre-emergent plant, wheat

Soil tillage system	Production (kg/ha)	Production, (%)	Difference ±	Differences significance
Reversible plough (a_1)	1883	100	Mt.	Mt.
Chisel (a_2)	1800	95.6	-83	-
Paraplow (a_3)	1817	96.5	-67	-
Rotary harrow (a_4)	1775	94.2	-108	-

DL (p 5%) = 154 kg/ha;
DL (p 1%) = 233 kg/ha;
DL (p 0.1%) = 374 kg/ha.

Table 3. Significance of production differences evaluated through Duncan test

Soil working variant	Soybean production (kg/ha)	Classification
a_4	1775	A
a_2	1800	A
a_3	1817	A
a_1	1883	A

Table 4. Soybean crop production varying with the soil tillage system and the pre-emergent plant, corn

Soil tillage system	Production (kg/ha)	Production (%)	Difference ±	Differences significance
Reversible plough (a_1)	1757	100	Mt.	Mt.
Chisel (a_2)	1613	91.8	-144	00
Paraplow (a_3)	1717	97.7	-40	-
Rotary harrow (a_4)	1467	83.5	-290	000

DL (p 5%) = 91 kg/ha;
DL (p 1%) = 138 kg/ha;
DL (p 0.1%) = 221 kg/ha.

Table 5. Significance of production differences evaluated through Duncan test

Soil working variant	Soybean production (kg/ha)	Classification
a_4	1467	A
a_2	1613	B
a_3	1717	C
a_1	1757	C

CONCLUSIONS

The soybean production recorded in the exeperimental years is in connection to the soil tilling system, the pre-emerging plant and the climateric conditions of the Someseni Plateau area.

The productions recorded in the experimental years with corn as the pre-emerging plant have an average of 1639 kg/ha, and with wheat as the pre-emerging plant, an average of 1819 kg/ha, this meaning a positive difference of 180 kg/ha. This difference is determined by the wheat as pre-emerging plant, which proves to be superior to the pre-emerging corn.

The analysis of soybean productions by the soil tilling system and the pre-emerging plant confirms that the largest productions have values between 1775 kg/ha and 1883 kg/ha after pre-emerging wheat, respectivly 1467 kg/ha and 1757 kg/ha after pre-emerging corn.

REFERENCES

Gus P., Rusu T, Bogdan I., 2004. Agrotechnique, Print house Risoprint, Cluj-Napoca.

Gus P., Rusu T., Bogdan I., 2004. Crop rotation and territory structure, Print house Risoprint Cluj-Napoca.

Marin D.I., Babeanu N., Budoi Gh., Muresan G., Niculina Gh., 2007. Research on the influence of soil works based on net primary production of agrophytocenoses soybeans and corn of the Moara Domneasca. Scientific papers, USAMV Bucuresti, Series A, Vol. L, p. 404-408.

Pop A.I., 2009. Establishing the influence of soil works and crop rotation upon soil, production and profit in the Somesan plateau. Phd Thesis, USAMV Library, Cluj-Napoca.

Sandoiu I.D., 1999. Problems regarding introducing of alternative soil tillage in Romanian Plateau. International Symposion, 'Minimum soil tillage systems', UASMV Cluj, Faculty of Agriculture, 21-22th of October 1999, Cluj-Napoca.