

## OILSEED RAPE PRODUCTION UNDER THE AUTUMN WATER STRESS CONDITIONS IN ROMANIA

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### Abstract

*In this paper, the authors analyze the most important technological factors affecting OSR crop establishment in the droughty years, noticed during the last 8 years. In Romania, many farmers have considered oilseed rape to be a high-risk crop, for some good reasons: uneven emergence because of drought during the planting and crop establishment periods, hard winters, very low densities in the spring, repeated temperature oscillations during early spring. High temperatures during pod filling period limit the yield. Seed quality is essential for crop establishment, especially under drought conditions. Deep cultivation in order to allow the rapeseed roots to go deep after water. Straw-management is also important. Early cultivation is recommended, to determine germination of lost seeds from the previous crop and weeds. The soil has to be kept black with glyphosate. For usual planting (1-15 September), the best results in the droughty years were obtained where seedbed was ready for planting in late July/mid August. Only few tillage operations have to be performed during the planting period.*

**Key words:** oilseed rape, drought, yield.

### INTRODUCTION

Oilseed rape (OSR) was one of the most profitable crops in Romania during the last 9 years. Nevertheless, large variation in area harvested and yield has been recorded.

Table 1. Dynamics of oilseed rape during the last 5 years in Romania

Specification	Units	2008	2009	2010	2011	2012
Area harvested	Thousands hectares	365.0	419.9	537.3	382.5	85.1
Yield	Kg/ha	1844	1357	1755	1951	
Total yield	Thousands tones	673.0	569.6	943.0	746.6	

However, many farmers have considered oilseed rape to be a high-risk crop, for some good reasons [2, 3, 4]:

- Drought during the planting period.
- Uneven emergence because of drought during the crop establishment period;

- Hard winters (the temperatures sometimes decrease below  $-20^{\circ}\text{C}$  or  $-25^{\circ}\text{C}$ ).
- Very low densities in the spring.
- Repeated temperature fluctuation during early spring (from  $+20^{\circ}\text{C}$  to  $-5^{\circ}\text{C}$ ).
- Droughty period during spring and summer.
- High temperatures (more than  $30^{\circ}\text{C}$ ) during pod filling period limit the yield to less than 2 t/ha (national average).

For all those reasons and some others, in 1995, only 305 ha cultivated with oilseed rape have been harvested in Romania.

Due to the very good prices of the harvest during the last few years, farmers had profit if the yield exceeded 1-1.2 t/ha. In 2011, some farmers have obtained a net income above 700-800 Euros/ha (for the yields higher than 4 t/ha). For these reasons, many technical arguments were found to indicate that oilseed rape is not quite a high-risk crop, such as:

- Between 1<sup>st</sup> and 6<sup>th</sup> of September, a rainfall (at least 10 l/m<sup>2</sup>) will occur in normal year all over the country (30 years average) [2].
- Freezing is not a major problem, according to map of the freezing risk for oilseed rape in Romania [2]

In conclusion, we could say that drought during planting and crop establishment periods remains a high risk factor affecting oilseed rape.

## MATERIAL AND METHOD

The information on which this analysis is based was gathered during some research projects: “Establishment of the rapeseed technology in order to increase yield and surface in the South and South – East of the Romania” (founded by World Bank and Ministry of Agriculture), CEEX Project (Contract BIOTECH nr. 2/06.10.2005): Complex valorisation of some renewable natural resources to obtain bio-fuels, glycerine and ecological solvents and Novel technologies to obtain bio-fuels from renewable sources specific to Romanian agriculture – TINOCIP, PN II, project no. 22138/2008.

## RESULTS AND DISCUSSIONS

In the autumn of 2011, Romanian farmers took the chance and tried to plant oilseed rape, despite the climate threats (drought period in late August and September). For that reason, 350.000 ha were planted. The poor crop establishment and a hard winter have determined the decreasing of the cultivated surface by 75%, up to 85,100 hectares.

One of the causes for this extreme reduction of the OSR cultivated surfaces could be the fact that Romanian farmers are not used to have low plant densities in spring.

It is very easy to understand that, if we are thinking that 10 years ago, their aim was to harvest 100 plants per m<sup>2</sup>. They do not trust technologies for low densities. Big farmers did not keep low profit crops (less than 2 t/ha). This was a reason why winter survival rate was so small in 2011/2012 [1]

In 2012, low plant densities produced higher yield than expected: 5-10 plants per m<sup>2</sup>

produced 0.7-2 t/ha, 10-15 plants per m<sup>2</sup> yielded 2-3 t/ha. As a result, the farmers who experienced low densities this year and the amazing OSR plants recovery will less likely replace rapeseed crop.

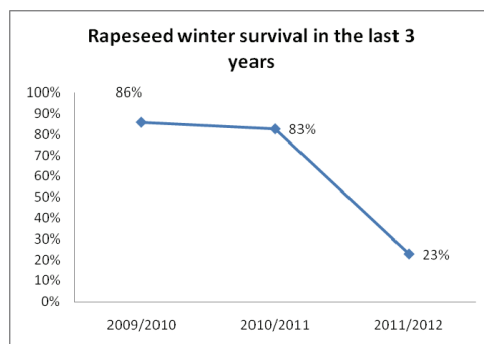


Fig. 1. OSR winter survival in the last 3 years

Some of the key points of the technologies used in droughty conditions by some of the most performing farmers are described below.

**1. Good quality seeds.** Seed quality is essential for crop establishment, especially under drought conditions. By using certificated seeds, the farmers could avoid fake seeds, with very low germination.

When only pure lines were planted in Romania (before 2003), many growers used to sow “farmer’s seed”, sometimes two years old. In this case, small vigour seeds determined poor establishment. After the introduction of the hybrids, the quality of the seeds used for planting significantly increased. When farmer’s seeds were used, the yield was between 2.5-3.5 t/ha (for pure lines) and 0.8-2 t/ha (for hybrids).

**2. Planting date - before or after rain?** In the last few years, in the South of Romania, oilseed rape plants seem to develop better if the seeds are sown after rain, even if the optimal sowing period is outdated.

When the sowing is in the dry soil, the rain before emergence could determine crust formation. Some hybrids such as Exagone (Monsanto), with fast development/growth in the autumn, allow farmers to wait for a September rain before planting.

Optimum planting period in the South of Romania: 1-10 September.

During the last few years, the best results were obtained when the farmers have planted oilseed

rape after a rainfall, even if they had to wait until 20<sup>th</sup> of September.

In the last few years, many experiments (in Romania and other Central European countries), were conducted to see if better results are obtained with early planting (8-15 August). In early planting bigger amount of inputs are used: two growth regulator applications and 2-3 insecticide treatments (because of longer vegetation period in the autumn).

A.I. Spinciu reported [7] that planting in 15 of August 2011, just after a 15 l/m<sup>2</sup> rainfall, was a better choice (3.2 t/ha) than sowing 8 days later (1.7 t/ha).

**3. Plant protection.** Under water stress conditions, herbicides applied before emergence have little effect. For that reason is better to avoid their application. A solution, hopefully soon available for Romanian farmers, will be the use of post emergence herbicide, such as Cleranda from BASF (metazachlor + imazamox) for hybrids from Clearfield system. Barley volunteers seem to be more harmful for OSR plants than winter wheat volunteers, due to the allelopathic effect of barley seedlings. Herbicide rotations determined some problems, especially in the droughty years. Sulfonylurea herbicides used for the previous crop are responsible for the uneven emergence.

When the farmers have learned that is better to plough after using sulfonylurea herbicides in a droughty year, another problem has arisen: deep soil tillage (plough and disks) increases water loss. These tillage practices affect crop emergence and establishment.

**4. Nitrogen fertilization.** In Romania, on many soils, nitrogen fertilization is needed in the autumn. In many cases, if nitrogen fertilizers are not applied, nitrogen deficiency could appear, because of straw incorporation.

**5. Soil tillage.** Romanian farmers have tried to improve soil tillage in order to save water. Direct drilling is now used on large surfaces. Some of the better performing farmers are thinking to use strip till.

In conventional tillage, a passage with a roller after planting increases the plant emergence.

We present a case study about technologies under droughty conditions [6].

**A. Farmer.** He cultivated 385 ha with OSR. The main characteristics of the technology are:

1. No ploughing. Soil tillage consists in stubble disc cultivation in the harvest day and soil loosens (35 cm depth) 3 weeks after. Both cultivator and soil loosener aggregates contained a roller. He rent some machinery in order to till in time. The final operation for seedbed preparation was made by a complex seed drill.

2. Two glyphosate applications: one before winter wheat harvest and another one 3 weeks after a rainfall.

3. Seedbed was ready in mid August.

4. 40 kg N/ha were used for fertilization in the autumn + 40 kg P<sub>2</sub>O<sub>5</sub>/ha. In the spring, 80 kg N/ha were added.

Plant densities in spring was 41 plants per m<sup>2</sup> and the yield was 3.5 t/ha.

**B. Part time farmer.** 20 ha with OSR.

1. Ploughing one week after harvest. 5 t/ha straw were incorporated. He did not till the soil until late August. Seedbed preparation was made in early September.

2. No fertilization in the autumn. In spring, part time farmer applied 90 kg N/ha.

Plant densities in spring was 21 plants per m<sup>2</sup> and the yield was 0.7 t/ha.

**6. Irrigation.** The irrigation is the ultimate method to improve crop establishment during the droughty periods.

A.I. Spinciu [7] mentioned the remarks from the experience of the autumn of 2011, when a severe drought was noticed in the South of Romania (see table 2).

Table 2. Irrigation effect on plant density and yield

Specification	Plant density per m <sup>2</sup>	Yield (t/ha)
Irrigated (300 mc/ha before planting on 27 <sup>th</sup> of August )	63	4
Irrigated (300 mc/ha before emergence)	58	3.6
Non irrigated, planted after 15 l rain/m <sup>2</sup> on 15 <sup>th</sup> of August	48	3.2
Non irrigated, planted "in dust" on 23 <sup>rd</sup> of August	20	1.7
	12-15	Destroyed

## CONCLUSIONS

- The best results in the droughty years were obtained where seedbed was ready for planting mid/late August.
- Only few tillage operations have to be performed during the planting period. In this situation, the plants have emerged and grew better.
- Early planting (early or mid August) seems to be a promising possibility for OSR in the droughty years.
- Planting after rainfall seems to be a better choice than sowing “in dust”.

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