

Electronic Journal of Polish Agricultural Universities is the very first Polish scientific journal published exclusively on the Internet, founded on January 1, 1998 by the following agricultural universities and higher schools of agriculture: University of Technology and Agriculture of Bydgoszcz, Agricultural University of Cracow, Agricultural University of Lublin, Agricultural University of Poznan, Higher School of Agriculture and Teacher Training Siedlce, Agricultural University of Szczecin, and Agricultural University of Wrocław.



**ELECTRONIC
JOURNAL
OF POLISH
AGRICULTURAL
UNIVERSITIES**

**2001
Volume 4
Issue 2
Series
HORTICULTURE**

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TENDAJ M., GRUSZECKI R., RODKIEWICZ T. 2001. EFFECT OF FLAT COVERING ON EARLINESS OF HARVEST AND YIELD OF SORREL LEAVES (*RUMEX ACETOSA* L.) **Electronic Journal of Polish Agricultural Universities**, Horticulture, Volume 4, Issue 2.

Available Online <http://www.ejpau.media.pl>

EFFECT OF FLAT COVERING ON EARLINESS OF HARVEST AND YIELD OF SORREL LEAVES (*RUMEX ACETOSA* L.)

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ABSTRACT

The aim of the experiment conducted in the years 1998-2000 was to assess the yielding and the possibility of accelerating the yield of sorrel leaves by means of a covering of with perforated PE and non-woven PP films.

Flat covering of sorrel with perforated PE (100 holes \varnothing 1 cm in 1 m²) and non-woven PP films (17 g for 1 m²) resulted in earlier harvest by 7-14 days and the marketable yield increase of 6.6-13.4%. The positive effect of flat covers in sorrel culture was most evident in the second and third years of harvest (plant exploitation), which was the third and fourth years of cultivation of these plants (leaves were not cut in the first year). Taking into account the total of three years' yield it turned out that perforated PE used as a cover was more beneficial as compared to non-woven PP, because the harvests were slightly earlier and the marketable yield as well as its share in the total

yield were higher. The covers protected young leaves against pest infestation and delayed the formation of flower stalks. Due to that the marketable share of the total yield was decisively higher than in the uncovered control.

Key words: sorrel, flat plant covering, perforated PE film, non-woven PP

INTRODUCTION

Flat covering of plants with perforated PE and non-woven PP films in the cultivation of many vegetable species may bring about measurable advantages such as earlier harvests, an increase in yield quantity, and improved quality [2, 3, 4, 5, 8, 9, 11]. The desirable effect of flat covering may be achieved due to improved, more favourable environmental conditions, assuring proper growth and development of plants. It applies especially to the possibility of maintaining a higher soil moisture level, higher temperature, protection against frost and some pest [6, 7, 9, 10]. The best results of cultivation of many vegetable species covered with perforated PE are achieved at long cold periods in the spring and at low insolation [2, 5]. While using perforated PE films, the quality and earliness of the yield depend however on the number of holes per 1 m² (density of perforation) and the duration of the covering [2, 5, 12].

Non-woven PP film used for plant covering as compared to perforated PE ensures better air circulation and thus the duration of the covering may be longer. Plants do not suffer from overheating or the physiological damages resulting from it [2, 3, 10].

The results of experiments using perforated PE and non-woven PP films in the cultivation of many vegetable species inclined us to study the possibility of using these covers in sorrel cultivation. Earlier experiments of Tendaj [13] concerning the effect of perforated PE film in the cultivation of two sorrel cultivars, prompted us to compare the results of implementing this cover and those of non-woven PP film. Thus, the aim of the study was to assess the yield and possibility to improve the earliness of sorrel leaves yielding by means of a covering of perforated PE and non-woven PP film.

MATERIALS AND METHODS

The experiment was carried out in the years 1997-2000 at the Experimental Station of the Agricultural University in Lublin – Felin. Sorrel of 'Large de Lyon' *cv.* was used in the study. This cultivar is widely cultivated in Poland and is known in all Europe, especially in France. The experiment was started on 10 May, 1997. It consisted of three blocks with a total number of 12 plots. There were 4 plots of the area 3 m² (1.5 m × 2 m) in each block. On each plot there were on average 90 sorrel plants.

For three consecutive years, starting from the second year of culture, early in the spring (or at the end of winter), sorrel was covered with perforated PE (100 holes Ø1 cm in 1 m²) and non-woven PP film weighing 17 g per 1 m². Non-covered plants were the control for the covered plots.

Covers were laid in March, when plants started the slow growth (4.03.1998, 12.03.1999, 28.03.2000). The average time of maintaining the covers on plants was 8 weeks for non-woven PP and 6 weeks in case of PE film.

Sorrel leaves of marketable size were cut three times each year (in the tables – I, II, III harvest). In the studied years harvests were started with plants covered with perforated PE

film: 1.04.1998, 9.04.1999, 10.04.2000; with plants covered with non-woven PP film: 1.04.1998, 14.04.1999, 13.04.2000; with the plants in the control: 15.04.1998, 26.04.1999, 21.04.2000. Harvests were finished on the following dates: with plants covered with perforated PE film: 22.04.1998, 7.05.1999, 25.04.2000; with plants covered with non-woven PP film: 6.05.1998, 21.05.1999, 12.05.2000; with the plants in the control: 27.05.1998, 21.05.1999, 16.05.2000.

In the third year of harvests non-covered sorrel plants after two cuts of leaves yielded many flower stalks and in fact in the collected total yield there was no marketable yield. Long lasting drought contributed to it as well, and its results were most visible in non-covered plants.

At each harvest date the total and marketable yields of leaves were recorded. The unmarketable part of the yield consisted mostly of young generative stalks, which tended to appear already after the first harvest, leaves damaged by pests such as *Gastroidea viridula* Deg., as well as those with symptoms of physiological disorders (e.g. yellow, curled).

RESULTS AND DISCUSSION

Short-term covering of sorrel plants much improved the yield earliness, and in the second and third years of harvest also positively affected the yield quantity (tab. 1, fig. 1). The use of perforated PE and non-woven PP films was a decisive factor in increasing the marketable share in the total yield (tab. 2). A higher yield obtained from the covered plants may be explained by more favourable growing conditions, especially in regard to the soil moisture content, as well as decreased pest infestation. The results of the studies on the use of perforated PE and non-woven PP film covers on other vegetables confirm these findings [1, 2, 5, 10].

Table 1. The effect of the kind of cover on the marketable yield of sorrel leaves (kg a⁻¹)

Kind of cover	1998				1999				2000				Total 1998-2000
	Harvest time												
	I	II	III	Total	I	II	III	Total	I	II	III	Total	
Perforated plastic film	52.43	73.20	61.77	187.40	176.88	90.54	31.48	298.90	83.00	82.33	126.00	291.33	777.63
Nonwoven PP	60.77	79.32	75.32	215.41	167.55	78.88	22.88	269.31	73.67	135.67	44.67	254.00	738.72
Control	42.99	148.43	82.10	273.52	165.77	49.10	46.99	261.86	96.33	54.00	–	150.33	685.71
Mean	52.06	100.32	73.06	225.44	170.07	72.84	33.78	276.69	84.33	90.67	85.33	231.89	734.02
LSD _{0.05} : Kind of cover				44.529				n.s.					52.160

Fig. 1. The effect of flat covering on the yielding of sorrel in the consecutive weeks of harvesting (mean from 1998-2000)

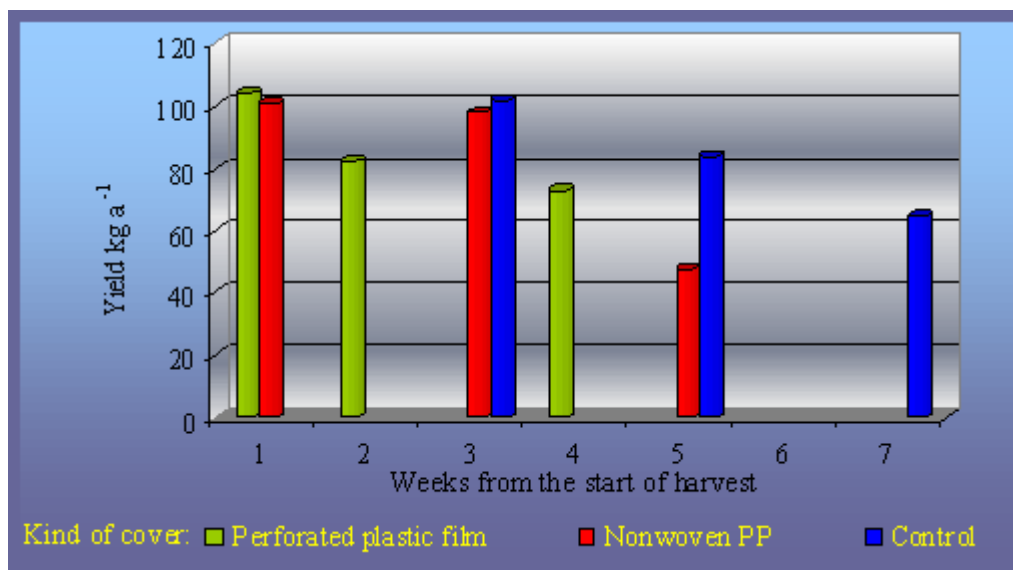


Table 2. The share of the marketable yield in the total according to the kind of cover

Kind of cover	1998				1999				2000				Mean			
	Harvest time															
	I	II	III	Mean	I	II	III	Mean	I	II	III	Mean	I	II	III	Mean
Perforated plastic film	63.4	85.5	68.1	72.3	95.9	48.0	99.4	81.1	95.4	95.7	80.9	90.7	88.2	68.3	78.8	78.4
Nonwoven PP	84.7	92.6	42.5	73.3	86.8	35.1	63.6	61.8	97.8	89.5	54.9	80.7	88.8	63.6	48.5	67.0
Control	82.5	65.6	40.4	62.8	72.6	21.2	94.0	62.6	96.6	36.6	–	66.6	80.3	41.5	51.0	57.6
Mean	76.9	81.2	50.3	69.5	85.1	34.8	85.7	68.5	96.6	73.9	67.9	79.3	85.8	57.8	59.5	67.7

In the first year of harvests (the second year of sorrel growth) the positive effect of covering the plants on the marketable yield quantity was not evident. However, its share in the total yield was higher (on average by 10%). In the case of covered plants, significantly earlier yields – by 14 days on average – were obtained. Similar results were recorded in earlier studies using only perforated PE film [13].

In the second year of plant exploitation (the third year of growth) harvests in the case of plants covered with perforated PE started 17 days earlier as compared to the non-covered plants, and 12 days earlier in the case of those covered with non-woven PP film. That year (1999) the marketable yield of leaves was significantly higher as compared to the previous year (1998) and the following one (2000). This applied especially to the plants covered with perforated PE and non-woven PP film. In the second year of harvest it turned out that a covering of perforated PE film was more favourable in respect to the yielding than a covering of non-woven PP. The marketable yield of leaves (mean 298.9 kg a⁻¹) as well as its share in the total yield was the highest (81%).

In the third year of sorrel harvesting (2000) a significant yield decrease was recorded comparing to the second year. The marketable yield of leaves obtained from plants covered with perforated PE and non-woven PP films was close in quantity to that obtained in the previous year, however, a great yield decrease in the case of non-covered plants was recorded. An additional advantage of sorrel cultivation under covers (similarly to previous years) was a substantially earlier yielding – 10 days on average in the case of perforated PE and 7 days with non-woven PP film. Besides, the share of the marketable yield in the total was very high that year – on average 79% (tab. 2).

The present studies to some extent confirm the results of the experiments with flat covering of other vegetable species [2, 3, 4, 5, 8, 12]. Perforated PE compared to non-woven PP film appeared to be a better cover for sorrel, as its application resulted in greater acceleration of the yield (on average by 7-10 days). In the experiment, the highest marketable yield of leaves and definitely its greatest share in the total yield was obtained in the case of plants covered with perforated PE. According to many authors, that effect in yielding could be achieved due to an early covering date (in 1998 already on 4.03), that is during the period of low temperatures.

CONCLUSIONS

1. Flat covering of sorrel resulted in substantially improved yield earliness by 7-14 days and the marketable yield increase by 7.6-13.4% (on average 53-92 kg a⁻¹).
2. The total yield of sorrel leaves yield from three years of harvest indicates the more beneficial effect of perforated PE use as compared to the non-woven PP. However, the use of non-woven PP as a short-term covering of plants, as compared to the control, resulted not only in earlier yields, but higher marketable yields in the second and third years of harvest.
3. Irrespective of the covers, the highest productivity was characteristic of sorrel in the third year of growth, which was the second year of harvest.
4. The positive effect of covers in sorrel cultivation was marked by their protective action against infestation by pests causing leaf-blade damage and delaying generative development. The share of the marketable yield in the total (undamaged leaves, no flower stalks) was the highest in the case of plants covered with perforated PE (on average, 78%), and the lowest in non-covered plants (control).

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