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## THE INFLUENCE OF MULCHING WITH PINE BARK ON THE GROWTH AND FLOWERING OF TWO GROUND COVER ROSES CULTIVARS ‘MEIFLOPAN’ AND ‘MEIDOMONAC’ AND RUNNING TO WEEDS OF EXPERIMENTAL PLOTS

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**ABSTRACT.** The experiments on cultivation of two chosen ground cover roses cultivars: ‘Meiflopan’ and ‘Meidomonac’, were carried out in the years 2003-2004. Plants were planted into two separate quarters, half of which was mulched with 10 cm layer of pine bark. Mulching was carried out only in the first year of cultivation. The length of all annual shoots and the diameter of 30 flowers chosen at random [cm] were measured and the numbers of shoots and inflorescences on all shrubs were recorded during vegetation period. Additionally, weeds were counted and identified on each experimental plot. Positive impact of mulching on the number and length of shoots in the second year of cultivation of roses shrubs was noted, and the decline in the number of weeds on the experimental plots and increasing of flowers diameter in inflorescences was observed.

**Key words:** ground cover roses, ‘Meiflopan’, ‘Meidomonac’, cultivation in green belts (landscape cultivation), mulching

### Introduction

In green belts of the cities more and more frequently cultivars of ground cover roses are planted. They are characterised by long and abundant blossom, large scale of flower colours and do not require large investments in care of them. The group of cultivars of ground cover roses was created in seventies of the last century out of group of ground roses cultivars, belonging to different races, including *Rosa polyantha*, *R. floribunda*, *R. paulii*, *R. rugosa* Thunb., *R. nitida* Willd., *R. virginiana* Herrm. and *R. agrestis* Savi (Jerzy et al. 1992).

Cultivars of ground cover roses are produced on their own roots. This causes they possess longer lifespan than shrubs, which are chip-budded. They are also healthier and more resistant to low temperatures. The shrubs branch strongly and quickly cover the

soil surface with shoots after planting. Ground cover roses are commonly used for flower-beds in green belts. Cultivars characterised with strong growth can be planted along roads and motorways.

Mulching has been used for a long time, mainly to slow down weed infestation of soil, and to increase soil moisture and permeability. It prevents soil from erosion, thickening and drying out of its surface. For mulching different organic materials can be used such as peat, straw, hay, husks, leaves, wood chips and bark, especially of coniferous species. In recent years bark is widely recommended for mulching in vegetable cultivation (Baumann and Kelm 1972, Bereśniewicz and Nowosielski 1975), in orcharding (Kęsik and Maskalaniec 2004, Kulesza 1994, Lipecki 1994) floriculture (Wiśniewska-Grzeszkiewicz 1982), as well as in cultivation of ornamental trees and shrubs (Korszun and Zalewska 2005). Pine bark decomposes slowly and is more durable than majority of organic materials. Large percentage of cork material isolates soil from temperature changes (Aaron 1976). It influences its physical properties i.e. stabilizes temperature, increases moisture and also, partially water capacity. Mulched plants are more resistant to frost penetration.

The aim of this experiment was to check the influence of a single mulching of the soil surface with a 10 cm layer of pine bark on growth and flowering of two ground cover roses cultivars, grown in the green belts of the cities as well as on weed infestation at experimental plots.

## Material and methods

The experiment was carried out in the years 2003-2004 on the area of The August Cieszkowski Agricultural University of Poznań.

Two ground cover roses cultivars 'Meiflopan' (= 'Alba Meidiland') and 'Meidomonac' (= 'Bonica 82') were tested in this experiment. Their names nomenclature was adopted after Hoffman et al. (2000). Plants for the experiment were obtained from propagation by shoot cuttings prepared in 2002 and grown for one year in container cultivation. In April 2003 roses were fertilised with fertiliser Osmocote Standard of 5-6-months nutrient release (N:P:K 15:9:9), in the dose of  $2.5 \text{ g} \cdot \text{dm}^{-3}$ . Plants were planted to the ground on 21 of April 2003 at two quarters (2 experimental plots each) with the dimensions of  $2.5 \times 9 \text{ m}$  each (of the area of  $22.5 \text{ m}^2$ ). Before planting 50 cm layer of soil was removed and replaced with compost soil enriched with Osmocote Standard fertiliser in the dose of  $20 \text{ g} \cdot \text{m}^{-2}$  i.e. 450 g per quarter. At each quarter 60 shrubs of one of the cultivars were planted with spacing  $50 \times 50 \text{ cm}$ . Half of a quarter i.e. a single experimental plot with 30 plants grown on it was covered 10 cm layer of coarse ground pine bark. The second plot was left without mulching with bark. After planting roses were watered twice a week for period of 14 days. In the second year of cultivation the mulching was not repeated. In the third decade of April 2004 fertilisation was done by application of 50 g of Agroblen fertiliser (N:P:K:Mg 15:9:11:3) per square meter. The fertiliser was applied in two equal doses.

In the experiments at each plant of each cultivar the length of annual shoots (cm) were measured and the number of shoots as well as inflorescences was counted. Also the diameter of 30 flowers chosen at random (cm) was measured. All the measurements mentioned were completed at each experimental plot separately. Biometric measure-

ments of shoots were conducted in one month time spacing from 25 of May to 29 of September and measurements of flower diameters and counting of the number of inflorescences was done dependently on the time of blossom of each cultivar of roses i.e. in 2003 on 6 of June and 23 of August for both of cultivars and in 2004 on 1 of July, 5 of August, 1 and 30 of September for 'Meiflopan' and on 1 of July and 5 of August for 'Meidomonac'.

At each plot separately from the first decade of May to the third decade of September weeds were counted, then the species identified and weed plants were removed from the plot. During vegetation period roses were sprayed with chemicals to protect them against aphids. In 2003 chemical Pirimor Aerosol 01 AE was used for spraying on 7 of June and 25 of July and in 2004 chemical Actara 25 WG on 30 of June. 250 ml of chemicals per quarter was used. Additionally on 12 and 26 of August 2004 shrubs of roses were sprayed against rose powdery mildew and rose black spot with chemical Sapro 190 EC.

The experiment had 2 combinations for each cultivar. In each combination there were 10 shrubs in 3 replications. The results were analysed statistically applying STAT software by one or two factor analysis of variance. Averages were compared by Duncan's test, at the significance level  $\alpha = 0.05$  for each term separately.

### **Characteristics of cultivars used for the experiment**

'**Meiflopan**' (= 'Alba Meidiland') possesses white, full flowers, with the diameter of 2-3 cm, gathered in bunches. Jerzy (2003 a) states that the cultivar blossoms late but abundant. Leaves are small and green with matt surface. Quick growth of shoots allows covering of soil surface in a relatively short time (Fig. 1). The cultivar is believed to be tolerant to rose black spot and rose powdery mildew (Ciesielski and Wybicki 2003).

'**Meidomonac**' (= 'Bonica 82') possesses widely spread, very leafy shoots. The flowers are of pink colour (Fig. 2). The blossom takes place from June to late autumn. Jerzy (2003 a) classified flowers of this cultivar to group of resistant to unfavourable atmospheric conditions.

### **Results**

The cultivars of ground cover roses used for this experiment possess different characteristics of growth, therefore the results of the analysis of the gathered data are discussed separately.

#### **'Meiflopan' cultivar**

Average number of shoots per shrub of ground cover rose cultivar 'Meiflopan' was increasing during the vegetation period. In 2003 mulching did not influence this examined feature. The number of shoots at both plots was similar and reached from 3.7 to 3.9 in the third decade of May up to 6.3 in the third decade of September (Table 1). In the

**Table 1**

**Average number of shoots per plant of a cultivar ‘Meiflopan’ depending on mulching  
in particular years of the experiment**  
**Średnia liczba pędów na roślinie odmiany ‘Meiflopan’ w poszczególnych latach  
prowadzenia doświadczeń, w zależności od zabiegu ściółkowania**

Year Rok	Kind of a trial field Rodzaj poletka	Number of shoots – Liczba pędów				
		date of measurement data wykonywania pomiaru				
		25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
2003	with pine bark z korą sosnową	3.9	5.3	4.2	5.9	6.3
	without pine bark bez kory sosnowej	3.7	6.0	4.8	5.9	6.3
2004	with pine bark z korą sosnową	7.3	8.3	8.8	9.5	11.5
	without pine bark bez kory sosnowej	6.6	8.0	8.0	9.2	11.3
LSD <sub>0,05</sub> NIR <sub>0,05</sub>	factor A* czynnik A	0.52	0.64	0.65	0.69	0.83
	factor B** czynnik B	0.52	0.64	0.66	0.69	0.83

Explanations: \*Factor A denotes the year of the experiment.

\*\*Factor B denotes mulching or its lack.

Objaśnienia: \*Czynnik A oznacza rok prowadzenia doświadczenia.

\*\*Czynnik B oznacza wykonanie zabiegu ściółkowania na poletku lub jego brak.

second year of cultivation roses produced 1.5 to twice more shoots; from 6.6 to 7.3 in May up to from 11.3 to 11.5 in September. More of annual shoots were present on shrubs grown at the mulched plot, however, statistical analysis of the results of experiment confirmed significant differences only for three terms of measurements taking (Table 1).

Synthesis of the results concerning the number of shoots per plant of ‘Meiflopan’ cultivar showed thickening of shrubs as vegetation period lasted. Roses possessed from 5.1 to 5.6 shoots in the third decade of May up to from 8.9 to 9.8 decade of September (Table 2). Values of the examined feature for every term of measurements taking were very similar. Statistical analysis did not show any differences among them.

Average length of an annual shoot of rose ‘Meiflopan’ cultivar in 2003 was from 22.7 (25 of May) to 33.1 cm (29 of September) at mulched plot and from 22.5 (25 of May) to 32.9 cm (29 of September) at not mulched plot (Table 3). At no term positive influence of mulching on the discussed feature was statistically confirmed. In the second year of cultivation roses grown at the plot covered with pine bark produced longer shoots. Statistical analysis showed significant differences among them, with the exception of the third decade of July (Table 3).



Fig. 1. Shrubs of the 'Meiflopan' variety after the second year of cultivation  
Ryc. 1. Krzewy odmiany 'Meiflopan' po dwóch latach uprawy



Fig. 2. Shrubs of the 'Meidomonac' variety after the second year of cultivation  
Ryc. 2. Krzewy odmiany 'Meidomonac' po dwóch latach uprawy

**Table 2**  
**Synthesis of the results on average number of shoots per plant of a cultivar ‘Meiflopan’**  
**Synteza wyników dotyczących średniej liczby pędów na roślinie odmiany ‘Meiflopan’**

Kind of a trial field Rodzaj poletka	Number of shoots – Liczba pędów				
	date of measurement data wykonywania pomiaru				
	25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
With pine bark Z korą sosnową	5.6	6.8	6.5	7.7	8.9
Without pine bark Bez kory sosnowej	5.1	7.0	6.4	7.5	9.8
LSD <sub>0.05</sub> – NIR <sub>0.05</sub>	0.74	0.90	0.92	0.98	1.18

**Table 3**  
**Average length of shoot per plant of a cultivar ‘Meiflopan’ depending on mulching**  
**in particular years of the experiment**  
**Średnia długość pędu na roślinie odmiany ‘Meiflopan’ w poszczególnych latach prowadzenia**  
**doświadczeń, w zależności od zabiegu ściółkowania**

Year Rok	Kind of a trial field Rodzaj poletka	Length of shoot (cm) – Długość pędu (cm)				
		date of measurement data wykonywania pomiaru				
		25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
2003	with pine bark z korą sosnową	22.7	16.4	25.4	30.2	33.1
	without pine bark bez kory sosnowej	22.5	18.0	27.2	31.3	32.9
2004	with pine bark z korą sosnową	38.5	43.7	42.2	45.1	40.2
	without pine bark bez kory sosnowej	34.1	40.4	43.0	40.3	36.7
LSD <sub>0.05</sub> NIR <sub>0.05</sub>	factor A* czynnik A	2.04	2.03	2.44	2.09	2.15
	factor B** czynnik B	2.07	2.06	2.43	2.15	2.16

Explanations: see Table 1.  
 Objasnienia: patrz tabela 1.

After conducting of synthesis of the experiment results concerning average length of shoot of rose cultivar ‘Meiflopan’ positive influence of soil cover with pine bark on the examined feature was not proved with the exception of the first term of measurements

taking i.e. on 25 of May (Table 4). Average length of shoot at shrub grown at mulched plot reached from 30.6 cm in the third decade of May to 36.7 cm in the third decade of September, and at not mulched plot from 28.3 cm to 34.8 cm respectively.

**Table 4**  
**Synthesis of the results on average length of shoot per plant of a cultivar 'Meiflopan'**  
**Synteza wyników dotyczących średniej długości pędu na roślinie odmiany 'Meiflopan'**

Kind of a trial field Rodzaj poletka	Length of shoot (cm) – Długość pędu (cm)				
	date of measurement data wykonywania pomiaru				
	25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
With pine bark Z korą sosnową	30.6	30.1	17.1	37.7	36.7
Without pine bark Bez kory sosnowej	28.3	29.2	17.6	35.8	34.8
LSD <sub>0,05</sub> – NIR <sub>0,05</sub>	2.89	2.87	1.59	2.95	3.03

The number of inflorescences at shrubs of 'Meiflopan' cultivar was different during vegetation period and depended on the term of measurement taking. In the first year of cultivation in June more abundant were flowering plants grown at plot not mulched with pine bark and in August differently, at the plot mulched with bark (Table 5). In 2004 the largest number of inflorescences was counted at rose shrubs on 1 of July i.e. 28.4 at the plot covered with pine bark and 29.7 at the plot without bark. In three terms more abundant blossom was recorded for plants grown at plot not mulched (Table 5).

**Table 5**  
**Average number of inflorescences of the plant 'Meiflopan' cultivar**  
**Średnia liczba kwiatostanów na roślinie odmiany 'Meiflopan'**

Kind of a trial field Rodzaj poletka	Number of inflorescences – Liczba kwiatostanów					
	date of measurement data wykonywania pomiaru					
	06.06. 2003	23.08. 2003	01.07. 2004	05.08. 2004	01.09. 2004	30.09. 2004
With pine bark Z korą sosnową	3.5	11.3	28.4	4.9	17.0	3.1
Without pine bark Bez kory sosnowej	4.5	9.8	29.7	5.7	10.1	3.2
LSD <sub>0,05</sub> – NIR <sub>0,05</sub>	0.79	2.66	1.10	0.74	6.50	0.08

In 2003 larger flowers were produced by roses grown at the experimental plot covered with pine bark i.e. 2.6 cm in the first decade of June and 2.8 cm in the third decade



of August. Statistical analysis confirmed differences between these values. In the second year of cultivation the values of examined feature were similar and reached from 2.5 to 3.3 cm (Table 6).

**Table 6**  
Average diameter of flower in the inflorescence of the plant 'Meiflopan' cultivar  
Średnia średnica kwiatu w kwiatostanie na roślinie odmiany 'Meiflopan'

Kind of a trial field Rodzaj poletka	Diameter of flower (cm) – Średnica kwiatu (cm)					
	date of measurement data wykonywania pomiaru					
	06.06. 2003	23.08. 2003	01.07. 2004	05.08. 2004	01.09. 2004	30.09. 2004
With pine bark Z korą sosnową	2.6	2.8	3.3	3.0	2.6	3.2
Without pine bark Bez kory sosnowej	2.3	2.6	3.0	2.8	2.5	3.1
LSD <sub>0,05</sub> – NIR <sub>0,05</sub>	0.15	0.16	0.15	0.42	0.25	0.16

In 2003 during vegetation period 2995 weeds were removed from the quarter. There were 448 weeds, belonging to 8 species at mulched plot. That was more than twice less than at not mulched plot. The most common weeds were: white goosefoot (Fat Hen) – 142 and field bindweed – 138 plant (Table 7). In the second year of cultivation larger number of weeds was recorded at plot mulched with pine bark. 779 weeds were removed from that plot and 691 from not mulched plot. Out of the total number of weeds 21 species were identified, and 14 species out of them were not present in 2003 (Table 7).

**Table 7**  
Species and number of weeds in cultivation of cultivars of roses 'Meiflopan'  
Gatunki i liczba chwastów w uprawie róż odmiany 'Meiflopan'

Species Gatunek	Number of weeds on a trial field in year Liczba chwastów na poletku w roku			
	2003		2004	
	with pine bark z korą sosnową	without pine bark bez kory sosnowej	with pine bark z korą sosnową	without pine bark bez kory sosnowej
1	2	3	4	5
<i>Glechoma hederacea</i> L.	0	0	1	1
<i>Teesdalea nudicaulis</i> (L.) R.Br.	0	0	32	36
<i>Echinochloa crus-galli</i> (L.) Beauv.	22	82	1	4
<i>Hypericum perforatum</i> L.	0	0	1	2

Table 7 – cont.

1	2	3	4	5
<i>Cardaminopsis arenosa</i> L.	0	0	0	38
<i>Stellaria media</i> (L.) Vill.	0	0	17	0
<i>Hieracium pilosella</i> L.	0	0	15	24
<i>Chenopodium album</i> L.	142	628	10	50
<i>Achillea millefolium</i> L.	0	0	5	0
<i>Sonchus asper</i> (L.) Hill.	0	0	0	8
<i>Taraxacum officinale</i> Weber	0	0	23	24
<i>Carduus acanthoides</i> L.	0	0	1	3
<i>Agropyron repens</i> L.	0	43	3	27
<i>Convolvulus arvensis</i> L.	138	110	656	402
<i>Galium aparine</i> L.	0	0	1	0
<i>Polygonum persicaria</i> L.	16	22	0	0
<i>Equisetum arvense</i> L.	7	37	2	16
<i>Amaranthus retroflexus</i> L.	45	30	0	4
<i>Oxalis stricta</i> L.	0	0	1	0
<i>Capsella bursa pastoris</i> (L.) Medicus	0	0	5	21
<i>Thlaspi arvense</i> L.	25	0	0	0
<i>Poa annua</i> L.	53	125	0	8
<i>Galinsoga parviflora</i> Cav.	0	0	5	23
Total – Razem: 2995	448	1077	779	691

#### ‘Meidomonac’ cultivar

Average number of shoots per plant of ‘Meidomonac’ cultivar in the first year of cultivation was not dependent on the coverage of soil with pine bark and reached from 3.4 (25 of July) to 5.0 (29 of September) at mulched plot and from 3.4 (25 of July) to 4.6 (29 of September) at not mulched one. Even if the values were different the results of analysis fell into one uniform statistical group for each single term (Table 8). In 2004 larger number of shoots was produced by roses grown at the plot with pine bark. In the third decade of May there was 6.4 shoots per plant on average and in the last term there was 10.2 shoots. Statistical analysis confirmed significant differences among values recorded in all terms of measurements taking (Table 8).

Synthesis of results from 2003-2004 concerning an average number of shoots per plant of ‘Meidomonac’ cultivar confirmed a positive influence of mulching with pine bark on thickening of shrubs. At mulched plot roses produced from 4.2 (25 of July) to 7.6

**Table 8**  
**Average number of shoots per plant of a cultivar 'Meidomonac' depending on mulching**  
**in particular years of the experiment**  
**Średnia liczba pędów na roślinie odmiany 'Meidomonac' w poszczególnych latach**  
**przewodzenia doświadczeń, w zależności od zabiegu ściółkowania**

Year Rok	Kind of a trial field Rodzaj poletka	Number of shoots – Liczba pędów				
		date of measurement data wykonywania pomiaru				
		25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
2003	with pine bark z korą sosnową	3.4	4.1	4.8	5.3	5.0
	without pine bark bez kory sosnowej	3.4	3.9	4.1	4.7	4.6
2004	with pine bark z korą sosnową	6.4	8.5	9.1	9.8	10.2
	without pine bark bez kory sosnowej	5.0	6.8	8.0	8.4 a	8.4
LSD <sub>0,05</sub> NIR <sub>0,05</sub>	factor A* czynniki A	0.60	0.66	0.67	0.65	0.69
	factor B** czynniki B	0.60	0.67	0.69	0.66	0.70

Explanations: see Table 1.  
 objaśnienia: patrz tabela 1.

(29 of September) shoots and at plot not covered with bark from 4.2 to 6.5 shoots respectively (Table 9). For all terms statistically significant differences among values were confirmed.

**Table 9**  
**Synthesis of the results on average number of shoots per plant of a cultivar 'Meidomonac'**  
**Synteza wyników dotyczących średniej liczby pędów na roślinie odmiany 'Meidomonac'**

Kind of a trial field Rodzaj poletka	Number of shoots – Liczba pędów				
	date of measurement data wykonywania pomiaru				
	25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
With pine bark Z korą sosnową	4.9	6.3	7.0	7.5	7.6
Without pine bark Bez kory sosnowej	4.2	5.4	6.1	6.6	6.5
LSD <sub>0,05</sub> – NIR <sub>0,05</sub>	0.84	0.94	0.95	0.92	0.98

In 2003 average length of shoot of ‘Meidomonac’ cultivar at both plots possessed similar values for all terms of measurements taking. Mulching influenced positively on examined feature only in the second year of cultivation (Table 10). Shrubs of ground cover roses grown at plot covered with pine bark produced during the vegetation period longer shoots. In comparison with the results from the first year of cultivation they were from 6.6 to 19.8 cm longer. These differences were statistically proved for all terms of measurements.

**Table 10**

**Average length of shoot per plant of a cultivar ‘Meidomonac’ depending on mulching in particular years of the experiment**  
**Średnia długość pędu na roślinie odmiany ‘Meidomonac’ w poszczególnych latach prowadzenia doświadczeń, w zależności od zabiegu ściółkowania**

Year Rok	Kind of a trial field Rodzaj poletka	Length of shoot (cm) – Długość pędu (cm)				
		date of measurement data wykonywania pomiaru				
		25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
2003	with pine bark z korą sosnową	16.0	17.1	18.8	20.6	21.5
	without pine bark bez kory sosnowej	15.4	17.5	18.6	20.1	20.1
2004	with pine bark z korą sosnową	27.2	36.9	36.1	36.9	38.3
	without pine bark bez kory sosnowej	22.0	30.8	26.1	26.8	28.4
LSD <sub>0,05</sub> NIR <sub>0,05</sub>	factor A* czynniki A	1.81	1.77	1.67	1.71	1.77
	factor B** czynniki B	1.85	1.85	1.89	1.91	1.93

Explanations: see Table 1.

Objaśnienia: patrz tabela 1.

After synthesis of the recorded data of average length of shoot at plant of ‘Meidomonac’ cultivar positive influence of mulching with pine bark on the examined feature for the entire duration of vegetation period was confirmed. Annual shoots, dependent on the term of measurements taking, were longer for 2.9 to 5.1 cm. The differences in values were statistically proved (Table 11).

Roses of ‘Meidomonac’ cultivar during vegetation period blossomed twice in both years of the experiment. In June 2003 shrubs produced average from 3.5 to 3.6 inflorescences at the plot with bark and from 1.9 to 2.9 inflorescences at the plot without bark. In the second year of cultivation the blossom was more abundant (Table 12). In the first decade of June from 9.6 to 15.3 inflorescences were counted on shrubs and in August from 3.6 to 8.6. Positive influence of mulching with pine bark was proved for both terms of measurements taking.

**Table 11**  
**Synthesis of the results on average length of shoot per plant of a cultivar 'Meidomonac'**  
**Synteza wyników dotyczących średniej długości pędu na roślinie odmiany 'Meidomonac'**

Kind of a trial field Rodzaj poletka	Length of shoot (cm) – Długość pędu (cm)				
	date of measurement data wykonywania pomiaru				
	25. 05.	26. 06.	25. 07.	26. 08.	29. 09.
With pine bark Z korą sosnową	21.6	27.0	27.4	28.8	29.9
Without pine bark Bez kory sosnowej	18.7	24.1	22.3	23.4	24.2
LSD <sub>0.05</sub> – NIR <sub>0.05</sub>	2.56	2.50	2.37	2.41	2.50

**Table 12**  
**Average number of inflorescences of the plant 'Meidomonac' cultivar**  
**Średnia liczba kwiatostanów na roślinie odmiany 'Meidomonac'**

Kind of a trial field Rodzaj poletka	Number of inflorescences – Liczba kwiatostanów			
	date of measurement data wykonywania pomiaru			
	06.06.2003	23.08.2003	01.07.2004	05.08.2004
With pine bark Z korą sosnową	3.5	2.9	15.3	8.6
Without pine bark Bez kory sosnowej	3.6	1.9	9.6	3.6
LSD <sub>0.05</sub> – NIR <sub>0.05</sub>	0.71	0.58	5.2	5.00

In both years of experiments conducting larger diameter of flowers was characteristic for 'Meidomonac' cultivar for the first term of blossom – i.e. 6.2 cm on 6 of June 2003 and 6.3 cm on 1 of July 2004 for plants grown at plot mulched with pine bark. These differences were statistically proved (Table 13).

Single covering of soil with 10 cm of pine bark definitely decreased the number of weeds at plots in both years of the experiment conducting. In 2003 at mulched plot 294 weeds were counted belonging to 9 species and as much as 1022 at not mulched plot. The later belonged to 7 species. Predominant species was white goosefoot, making respectively 47.3 and 65.4% of total number of weeds. In the second year of cultivation the number of weeds was 422 for mulched plot and 765 for not mulched one. The number of identified species rose from 10 to 29 (Table 14).

**Table 13**

**Average diameter of flower in the inflorescence of the plant 'Meidomonac' cultivar**  
**Średnia średnica kwiatu w kwiatostanie na roślinie odmiany 'Meidomonac'**

Kind of a trial field Rodzaj poletka	Diameter of flower (cm) – Średnica kwiatu (cm)			
	date of measurement data wykonywania pomiaru			
	06.06.2003	23.08.2003	01.07.2004	05.08.2004
With pine bark Z korą sosnową	6.2	5.5	6.3	5.4
Without pine bark Bez kory sosnowej	4.7	4.9	5.7	5.0
LSD <sub>0,05</sub> – NIR <sub>0,05</sub>	0.71	0.54	0.45	0.56

**Table 14**

**Species and number of weeds in cultivation of cultivar of roses 'Meidomonac'**  
**Gatunki i liczba chwastów w uprawie róż odmiany 'Meidomonac'**

Species Gatunek	Number of weeds on a trial field in year Liczba chwastów na poletku w roku			
	2003		2004	
	with pine bark z korą sosnową	without pine bark bez kory sosnowej	with pine bark z korą sosnową	without pine bark bez kory sosnowej
1	2	3	4	5
<i>Glechoma hederacea</i> L.	0	0	34	12
<i>Geranium sanguineum</i> L.	0	0	1	2
<i>Centaurea cyanus</i> L.	0	0	1	0
<i>Teesdalea nudicaulis</i> (L.) R.Br.	0	0	0	28
<i>Echinochloa crus-galli</i> (L.) Beauv.	24	26	8	10
<i>Hypericum perforatum</i> L.	0	0	1	0
<i>Sinapsis alba</i> L.	0	0	31	0
<i>Stellaria media</i> (L.) Vill.	0	0	124	17
<i>Erodium cicutarium</i> (L.) L'Hérit	0	0	9	34
<i>Chenopodium album</i> L.	139	668	14	64
<i>Trifolium pratense</i> L.	0	0	1	6
<i>Achillea millefolium</i> L.	0	0	18	25

Table 14 – cont.

1	2	3	4	5
<i>Sonchus asper</i> (L.) Hill.	22	0	0	4
<i>Sonchus oleraceus</i> L.	19	0	1	0
<i>Taraxacum officinale</i> Weber	0	0	21	21
<i>Carduus acanthoides</i> L.	0	0	0	1
<i>Agropyron repens</i> L.	0	10	0	25
<i>Potentilla anserina</i> L.	0	0	16	4
<i>Urtica dioica</i> L.	0	0	3	0
<i>Convolvulus arvensis</i> L.	11	138	84	452
<i>Galium aparine</i> L.	0	0	2	0
<i>Polygonum persicaria</i> L.	0	0	24	0
<i>Polygonum aviculare</i> L.	0	0	7	2
<i>Equisetum arvense</i> L.	24	15	21	4
<i>Amaranthus retroflexus</i> L.	12	22	16	39
<i>Oxalis stricta</i> L.	0	0	0	8
<i>Thlaspi arvense</i> L.	11	0	2	0
<i>Poa annua</i> L.	32	119	4	4
<i>Galinsoga parviflora</i> Cav.	0	0	3	3
Total – Razem: 2503	294	1022	422	765

## Discussion

In countries of Western Europe the group of cultivars of ground cover roses is planted in green belts for many years (**Bünemann** 1980). Cultivars of *Rosa rugosa* species as well as new cultivars characterised with full, small flowers are planted. Possibilities of using of ground cover roses are various. They can be used for planting at green squares, flower-beds, slopes, along pavements and streets, in rock gardens, graveyards and instead of lawns (**Ciesielski** 2000, **Jerzy et al.** 1992).

Cultivars of ground cover roses are sufficiently resistant to city conditions i.e. low humidity, air pollution and soil salinity (**Jerzy et al.** 1992, **Wiśniewska-Grzeszkiewicz** 1995). The cultivars are also resistant to mechanical damages, penetration with cold and freezing. To a high degree they are tolerant to diseases and pests. They do not require many care measures. Rejuvenating of shrubs is done every 4 to 6 years. There is no need for flower removal after blossom or mounding of plants for winter (**Jerzy et al.** 1992).

The experiment designed for checking the possibility of planting roses in cities was conducted by **Grittner** and **Jesch** (1999). They planted 31 taxons of wild roses propagated by different means at the green belts of the city of Berlin. The authors checked the growth of shrubs, resistance to adverse climatic and soil conditions as well as to diseases and pests. They also evaluated their decorative qualities i.e. blossom, fruiting and autumn turn of leaves colour. On the basis of 5 years records they chose taxons of roses suitable for cultivation in the cities.

Covering of soil surface with pine bark is used for many years in horticulture cultivation equally for vegetables, flowers, fruit and ornamental trees and shrubs. Mulching is very important and desired especially in plant growing in city conditions. It decreases to significant degree weed infestation, drying out of soil and improves its structure. **Laskowska** and **Słowińska-Jurkiewicz** (1996) conducted morphological studies of soil surface structure, mulched with organic materials. The authors proved, that covering of soil with composted pine bark had notable influence on preserving and keeping proper soil structure during winter.

**Kulesza** (1994) states that mulching decreases weed infestation and by this eliminates application of herbicides. **Hetman et al.** (1986) researched soil physical and chemical properties under different mulching materials in crocus field cultivation. They found that mulching protected plants against abrupt temperature drop and positively influenced bulb yield. Pine bark in the lowest degree caused soil thickening and helped maintaining its largest air capacity. **Wiśniewska-Grzeszkiewicz** (1982) studied suitability of bark compost and raw bark for mulching in gladiolus cultivation. The author found that 4 cm thick layer of mulch composed of these materials improved flower quality and increased yield of bulbs. Mulching of soil surface decreased to a substantial degree weed germination and positively influenced physical soil properties, increasing moisture and stabilizing its temperature.

**Kęsik** and **Maskalaniec** (2004) stated after **Lipecki** (1992), that mulches have mainly a positive influence on the supply of orchard plants with nutrients and water. Additionally organic materials after decomposition enrich soil with humus. The authors researched influence of soil mulching with 5 different kinds of materials, in this bark of coniferous trees, on the content of mineral constituents in soil and strawberry leaves. Among others they found that under mulch composed of sawdust and bark there was the lowest potassium content in the soil and that all kinds of mulch positively influenced the content of this nutrient in strawberry leaves. **Lipecki** (1994) showed that soil mulching with different materials, in this composted pine bark positively influenced growth of apple budded plants and their production of lateral shoots, especially in a year characterized with low rainfall in spring and early summer.

**Jerzy et al.** (1992) and **Jerzy** (2003 b) recommend mulching in growing of different cultivars of ground cover roses. **Korszun** and **Zalewska** (2005) found, that application of 10 cm layer of ground cover composed of pine bark positively influenced the number and the shoots length of roses cultivars 'Nozomi' and 'Spevu' in the second year of cultivation and decreased number of weeds. Similar results the authors received in the experiment described here. Additionally in the second year of cultivation that treatment positively influenced the diameter of flowers of 'Meiflopan' and 'Meidomonac' cultivars and the number of inflorescences per plant of 'Meidomonac' cultivar.



## Conclusions

1. Cultivars of ground cover roses 'Meiflopan' and 'Meidomonac' used in the experiment can be grown at city green belts.
2. Positive influence of a single cover of soil with 10 cm layer of pine bark on the number and the length of shoots of plants of both cultivars was visible in the second year of cultivation.
3. There was no visible influence of mulching on the number of inflorescences. Roses of 'Meiflopan' cultivar blossomed more abundantly at the plot without pine bark, and of 'Meidomonac' cultivar on the contrary – at mulched plot.
4. Roses cultivated at the plot covered with the layer of pine bark possessed a larger diameter of flowers.
5. Application of the layer of pine bark decreased running to weeds of plots, where the roses were grown, to a high degree with the exception of the second year of cultivation of 'Meiflopan' cultivar.

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WPŁYW ŚCIÓLKOWANIA GLEBY KORĄ SOSNOWĄ NA WZROST  
I KWITNIENIE OKRYWOWYCH ODMIAN RÓŻ ‘MEIFLOPAN’  
I ‘MEIDOMONAC’ ORAZ ZACHWASZCZENIE POLETEK

S t r e s z c z e n i e

Doświadczenia nad uprawą dwóch wybranych okrywowych odmian róż, ‘Meiflopan’ i ‘Meidomonac’, przeprowadzono w latach 2003-2004 na terenie Akademii Rolniczej im. A. Cieszkowskiego w Poznaniu. Celem pracy było sprawdzenie wzrostu i kwitnienia róż w zależności od jednorazowego ściółkowania gleby 10-centymetrową warstwą kory sosnowej. Rośliny posadzone na dwóch kwaterach, z których połowa była pokryta 10-centymetrową warstwą kory sosnowej. Ściółkowanie wykonano tylko w pierwszym roku uprawy. W okresie wegetacji mierzono długość wszystkich jednorocznych pędów i średnicę 30 losowo wybranych kwiatów (cm) oraz liczono pędy i kwiatostany na wszystkich krzewach. Dodatkowo liczono i oznaczano chwasty na każdym poletku. Stwierdzono korzystny wpływ ściółkowania na liczbę i długość pędów w drugim roku uprawy krzewów oraz zmniejszenie zachwaszczenia na poletkach. Na krzewach uprawianych na poletkach ściółkowanych korą sosnową nie stwierdzono przemarznięcia roślin.