

# 玫瑰扦插繁殖之條件

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## 摘 要

玫瑰的繁殖方式有高壓、扦插、嫁接、組織培養等方式，目前國內採用扦插法為主，在荷蘭Aalsmeer試驗場已建立適合玫瑰扦插繁殖最適條件，供應生產岩棉栽培用玫瑰，國內亦有必要建立一套自己的扦插繁殖條件。玫瑰花一般的扦插方式法是以3~5節進行扦插，但成活率不高，近年已有採用單節扦插方式，利用良好之設備條件，成活率有提高之現象。扦插苗較之傳統採用高壓繁殖可較省工及繁殖倍數較高，比較扦插苗之發育與其他方式培育之種苗，共並無明顯差異。

玫瑰不定根的形成可分為根原體引發分化期、根原體分化期、新根出現3階段，玫瑰不定根形成的位置在於次級韌皮部發生，其發生的過程係先產生癒傷組織再生根。

植物扦插繁殖成功與否的條件受內在及外在因子影響，其中(一)內在因素包括：(1)化學因素如：生長素、營養物質的含量。(2)生物因子：插穗的長度、位置、成熟度等。(二)外在因素：光度、溫度、濕度、長短日照、插穗用介質、及外加生長素、外加糖份營養劑等影響。

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	Carbohydrate type (0.058 M)					LSD (P=0.05; n=8)
	Sucrose	Glucose	Maltose	Fructose	Sorbitol	
<i>Potentilla fruticosa</i> 'Tangerine'						
Shoot height (mm)	38.6	37.1	37.3	30.9	26.0	5.3
Fresh wt. (mg)	73	65	67	50.5	45.0	17.0
Dry wt. (mg)	20.7	18.7	19.0	14.9	11.9	4.6
Establishment (%)	97.5	97.5	100	85.0	95	–
<i>Ficus lyrata</i>						
Shoot height (mm)	16.1	14.3	12.6	11.8	10.9	2.34
Fresh wt. (mg)	142.0	140.0	99.0	110.0	86.0	40.0
Dry wt. (mg)	24.3	22.9	15.2	17.1	13.6	6.0
Establishment (%)	97.5	100	95	100	100	–

TABLE 1  
Means for characteristics of 50 dwarf rose cultivars and their 21-day-old single-node softwood cuttings; result from analysis of variance (signl P=0.05)

Cultivars	Leaf area (cm <sup>2</sup> )	Percent rooted	Sprout length (mm)	Root weight (eg)	Cultivars	Leaf area (cm <sup>2</sup> )	Percent rooted	Sprout length (mm)
'Amanda'	25	100	85.1	50.6	'Mcitriscal'	–	3	5.0
'Amourette'	13	90	31.0	19.8	'Morsdag'	17	83	22.2
'Baby Carnaval'	12	97	27.5	19.7	'Mr. bluebird'	20	70	24.4
'Bambino'	11	10	27.8	18.5	'Oakington Ruby'	8	93	19.4
'Bit O'Sunshine'	9	90	15.7	14.5	'Orange Meilandina'	17	83	21.5
'Cinderella'	7	80	11.2	11.8	'Peon'	5	100	22.4
'Cricri'	16	63	18.3	23.1	'Perla de Alcanada'	6	83	12.4
'Disck Koster'	19	73	24.7	29.6	'Perla de Montserrat'	9	100	15.8
'Dopey'	–	33	12.8	28.8	'Pink Heather'	9	43	7.0
'Dwarfking'	12	100	35.4	29.2	'Pink Meilandina'	22	93	40.4
'Easter Morning'	8	87	27.7	20.0	'Pixie Rose'	17	90	24.7
'Elwina'	–	97	19.4	36.0	'Robin'	8	13	8.8
'Estima'	22	97	69.1	60.8	<i>R. multiflora nana</i>	–	100	75.5
'Finlandia'	20	73	27.3	42.2	<i>R. rouletii</i>	5	80	16.9
'Finnstar'	18	90	23.9	36.5	'Scarlet Pimpernel'	13	83	16.2
'Golden Meilandian'	13	80	25.0	31.9	'Scarletta'	10	93	16.2
'Gulletta'	16	87	25.5	27.1	'Schanbiran'	20	80	27.2
'Indian Meilandina'	15	90	28.4	27.5	'Silver Tips'	10	93	22.6
'Lavender Lace'	18	87	30.0	29.8	'Simple Simon'	8	93	8.6
'Lavender Meilandina'	15	67	30.3	15.4	'Starina'	14	80	30.6
'Lillan'	8	97	16.0	22.8	'Stras and Stripes'	14	60	7.9
'Lollipop'	15	43	20.1	11.4	'Sunmaid'	13	83	29.5
'Magic Carrousel'	13	100	28.2	37.9	'Sweet Fairy'	6	93	17.5
'Margo Koster'	15	40	10.5	16.9	'The Fairy'	14	33	11.6
'Mcincadcentel'	12	67	10.7	10.5	'Yellow Doll'	14	93	37.8
					Overall mean	13.3	78.0	24.5
					CV	26.9	22.1	64.3
					F-value	24.2	10.7	25.5
					LSD	1.7	19.9	9.6

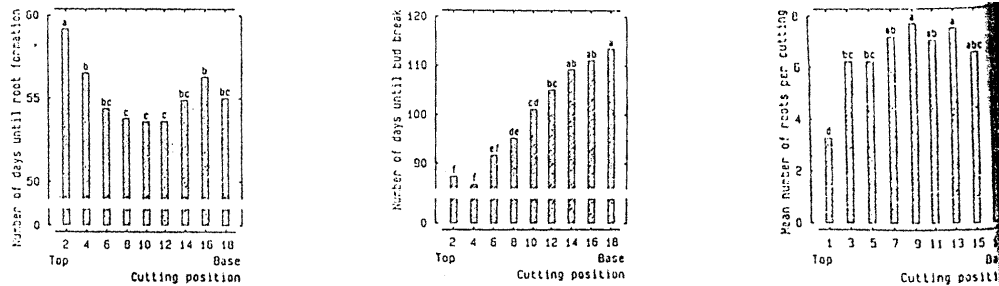


Fig. 3. Average number of days until appearance of first root at the pot surface as a function of cutting position on the stock plant. Bars with different letters denote significant differences based on LSD values (P<0.05).

Table 3 Effect of temperature and daylength on bud break and root formation in cuttings of some rose cultivars. The propagatoin period was 4 weeks. The cutting were illuminated 8 hours a dy (SD), 4000 lux at plant level. The long day (LD) was established by means of weak incandescent light for 16 hours.

Cultivar	Temp °C	Day-length	Bud break %	Root formation %	Roots per cutting	Length of root cm	Callus formation
Gamette	15	SD	54	44	1.0	0.4	1.5
		LD	35	52	1.4	0.7	2.0
	21	SD	50	78	2.9	2.4	1.8
		LD	44	95	4.4	3.1	1.6
Zorina	27	SD	46	100	5.0	4.2	1.5
		LD	25	88	3.7	2.7	0.9
	15	SD	72	7	0.1	0.1	2.6
		LD	48	16	0.2	0.1	1.6
Orange Mother's Day	21	SD	47	32	0.8	0.6	1.6
		LD	34	90	3.0	2.4	1.7
	27	SD	31	94	3.4	3.3	2.2
		LD	11	41	1.1	0.7	1.5
Orange Mother's Day	15	SD	85	20	0.3	0.1	0.3
		LD	83	37	0.9	0.4	0.3
	21	SD	63	50	2.1	1.3	0.5
		LD	52	88	3.3	2.8	0.4
27	SD	38	97	4.7	5.4	0	
	LD	60	100	5.1	6.9	0	

Table 4 The effect of temperature and light intensity on bud break and root formation in 'Roswytha' roses.

Temperature	Light intensity lux	Bud break %	No. of roots/cutting	Length of root, cm
15°C	2000	29	6.3	1.2
	10000	33	4.8	1.4
18°C	2000	30	6.8	2.6
	10000	49	9.6	4.2
21°C	2000	49	8.0	4.4
	10000	48	10.8	5.3
24°C	2000	51	8.3	5.3
	10000	62	10.1	6.7

Table 5. The effect of various auxins on bud growth and root formation in rose cuttings of 'Granette'. Temperature 21°C and natural light condition (August). The experiment was evaluated after 6 weeks.

Temperature	Bud growth cm	Roots per cutting	root length cm	Callus formation
Control	3.5	5.6	6.9	0.7
IBA 500 ppm	6.4	9.2	7.8	0.4
	6.0	12.3	8.3	0.3
	8.8	25.4	9.0	0.1
1AA 500 "	3.0	6.9	6.6	0.5
	5.2	7.2	6.8	0.7
NAA 500 "	4.2	6.7	6.6	0.6
	3.1	6.6	6.5	0.6

Table 6. The influence of temperature and auxin on root formation and bud break of the rose cultivar 'Roswytha'.

Temperature	IBA ppm	Bud break %	Roots per cutting	Root length cm
15°C	0	55	1.8	0.7
	300	40	3.6	1.2
	900	25	5.7	1.3
18°C	1800	15	8.2	1.8
	0	54	3.3	2.2
	300	42	5.9	2.6
21°C	900	27	7.6	2.7
	1800	22	11.3	3.4
	0	62	4.7	3.6
24°C	300	46	6.2	4.3
	900	40	10.3	5.2
	1800	46	14.3	5.5
24°C	0	71	3.8	3.9
	300	53	6.8	5.2
	900	47	10.2	6.3
1800	52	13.5	7.0	

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		LD	44	95	4.4	3.1	1.6
Zorina	27	SD	46	100	5.0	4.2	1.5
		LD	25	88	3.7	2.7	0.9
	15	SD	72	7	0.1	0.1	2.6
		LD	48	16	0.2	0.1	1.6
Orange Mother's Day	21	SD	47	32	0.8	0.6	1.6
		LD	34	90	3.0	2.4	1.7
	27	SD	31	94	3.4	3.3	2.2
		LD	11	41	1.1	0.7	1.5
Orange Mother's Day	15	SD	85	20	0.3	0.1	0.3
		LD	83	37	0.9	0.4	0.3
	21	SD	63	50	2.1	1.3	0.5
		LD	52	88	3.3	2.8	0.4
27	SD	38	97	4.7	5.4	0	
	LD	60	100	5.1	6.9	0	

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15°C	2000	29	6.3	1.2
	10000	33	4.8	1.4
18°C	2000	30	6.8	2.6
	10000	49	9.6	4.2
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	10000	48	10.8	5.3
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	10000	62	10.1	6.7

Table 5. The effect of various auxins on bud growth and root formation in rose cuttings of 'Granette'. Temperature 21 °C and natural light condition (August). The experiment was evaluated after 6 weeks.

Temperature	Bud growth cm	Roots per cutting	root length cm	Callus formation
Control	3.5	5.6	6.9	0.7
IBA 500 ppm	6.4	9.2	7.8	0.4
1000 "	6.0	12.3	8.3	0.3
2000 "	8.8	25.4	9.0	0.1
1AA 500 "	3.0	6.9	6.6	0.5
2000 "	5.2	7.2	6.8	0.7
NAA 500 "	4.2	6.7	6.6	0.6
2000 "	3.1	6.6	6.5	0.6

Table 6. The influence of temperature and auxin on root formation and bud break of the rose cultivar 'Roswytha'.

Temperature	IBA ppm	Bud break %	Roots per cutting	Root length cm
15°C	0	55	1.8	0.7
	300	40	3.6	1.2
	900	25	5.7	1.3
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	0	54	3.3	2.2
	300	42	5.9	2.6
21°C	900	27	7.6	2.7
	1800	22	11.3	3.4
	0	62	4.7	3.6
24°C	300	46	6.2	4.3
	900	40	10.3	5.2
	1800	46	14.3	5.5
24°C	0	71	3.8	3.9
	300	53	6.8	5.2
	900	47	10.2	6.3
	1800	52	13.5	7.0

Table 1 The effect of position of rose cuttings on bud break and root formation. The positions are numbered from top downwards.

Cultivar	Position	Bud break %	Root-formation %	Roots per cutting	Length of root cm	
Carnette	3	100	100	7.4	8.1	
	4	100	100	8.1	6.4	
	5	83	100	7.4	6.6	
	6	63	100	7.2	6.5	
	7	21	95	5.8	5.6	
	8	21	95	4.9	5.9	
	9	14	93	4.8	5.1	
	10	10	50	2.8	4.1	
	Zorina	3	94	100	6.6	13.1
		4	77	100	7.3	12.6
5		72	100	6.2	12.3	
6		75	94	6.1	9.5	

Table 3. The effect of IBA on the time and frequency of sprouting, on the rooting percentage and the root fresh weight of 'Amanda' rose single-node softwood cuttings

	IBA concentration (eg l <sup>-1</sup> )			
	0	312.5	625	1250
Days to bud-break	4.5a	5.2b	5.8b	6.8c
Sprouting frequency (z)	100a	97.5a	89.2b	89.2b
z Cuttings rooted	100a	100a	100a	87a
Regoot weight (eg)	24.1a	30.4a	29.3a	31.4a

Means in the same row indicated by the same letter do not differ significantly for p=0.05.

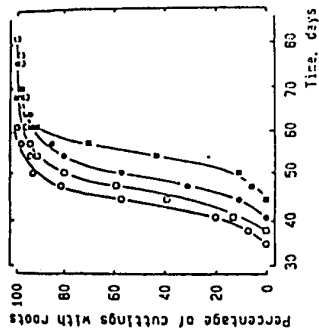


Fig. 1. Percentage of cuttings with roots as a function of time. Cuttings were treated with 20°C for 2 (O-O), 3 (□-□) or 4 (●-●) weeks followed in each case by 23°C or with 20°C for 9 weeks (□-□)

Root formation and axillary bud break after different temperatures and durations of these temperatures during the rooting period. After treatments with 17 or 20°C for 2, 3 or 4 weeks the cuttings were exposed to 23°C until rooting was assessed 9 weeks after excision and planting of the cutting

Duration of temperature treatment	Temperature (°C)	
	17	20
Mean number of roots per cutting		
2	5.6bcd	7.1 <sup>e</sup>
3	5.2bc	6.7 <sup>de</sup>
4	5.1b	6.9 <sup>e</sup>
9	0a	6.3 <sup>de</sup>
Percentage of cutting with roots		
2	98.1 <sup>ab</sup>	100 <sup>a</sup>
3	96.3 <sup>ab</sup>	98.1 <sup>ab</sup>
4	92.6 <sup>b</sup>	98.1 <sup>ab</sup>
9	1.9 <sup>c</sup>	96.3 <sup>ab</sup>
Mean number of days until root appearance		
2	49.9 <sup>cd</sup>	44.9 <sup>e</sup>
3	57.4 <sup>b</sup>	48.0 <sup>d</sup>
4	57.4 <sup>b</sup>	51.8 <sup>c</sup>
9	91.2 <sup>a</sup>	56.3 <sup>b</sup>
Mean number of days until bud break		
2	98.0 <sup>cd</sup>	90.8 <sup>ef</sup>
3	102.4 <sup>bc</sup>	95.3 <sup>de</sup>
4	106.1 <sup>b</sup>	95.8 <sup>de</sup>
9	121.0 <sup>a</sup>	103.4 <sup>bc</sup>

Values followed by different superscripts are significantly different using LSD values (P<0.05)

Table 2. The effect of removal of leaves of rose cuttings on root formation and bud break in the cultivar 'Gamette'. The cutting were rooted at about 22°C and under 50% reduced natural light condition (in spring. Each treatment comprised 25 cuttings.)

Treatment	Roots per cutting	Length of root cm	Bud growth cm
5-leaflet leaf intact	9.9	4.9	0.1
Removed 1 leaflet	9.1	5.1	0.5
Removed 3 leaflets	7.9	5.4	1.0
Removed 5 leaflets	1.9	1.9	1.4
Removed whole leaf	0	0	1.6

Comparison of mist propagation and "sauna" propagation. *R. multiflora* 'K-1' as stock

Propagation equipment	Number of successful graft unions	Degree of rooting	Degree of scion growth
Mist	24.1a	2.40a	2.50a
"Sauna"	19.1b	1.06b	1.04b

Experiment 1. The influence of ripeness of the rootstock-internode and the concentration of applied IBA after 19 days of development of stentlings. Combination 'Sonia'/'Indica Major'; 25 plants per treatment; diameter of the rootstocks 6-8 mm; growing period 11-13 Sept. 19 days

Stage of ripeness	Concentration of IBA (mg l <sup>-1</sup> )	Successful stentling (%)	Rooted (%)
Immature	0	52	12
Immature	2500	36	36
Immature	5000	12	12
Mature	0	100	88
Mature	2500	96	83
Mature	5000	100	100

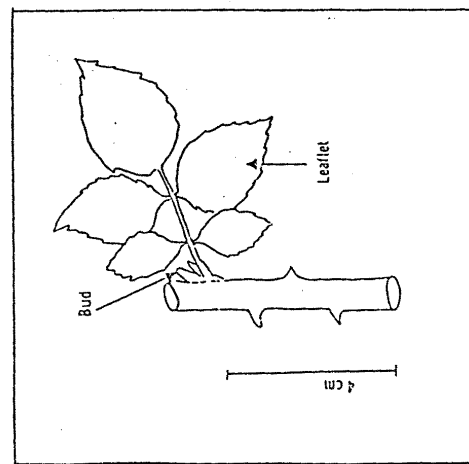


Fig 2. Stem cutting of rosea with one leaf which consists of 5 leaflets. The shoot might be cut into stem cuttings of 4-6 cm length.

Table 5. Percent rooted (%R), average number of roots (ANR) and average root length in mm (ARL) for three rose cultivars treated with four concentrations of IBA. Means within a column followed by the same letter are not significant at P=0.05, LSD.

IBA (ppm)	'Royalty'			'Samantha'			'Sonia'		
	%R	ANR	ARL	%R	ANR	ARL	%R	ANR	ARL
125	90.0ab	4.8a	3.9a	95.7a	8.0a	8.1a	83.4a	7.2a	14.5a
250	100. a	6.7a	5.4a	96.7a	7.3a	12.3b	96.1ab	13.5b	18.6b
500	100. a	10.2a	9.9b	100. a	10.3a	12.8b	96.2b	23.4c	25.3c
750	84.6b	8.4a	5.7a	100. a	11.3a	15.3b	96.7ab	28.5d	24.9c