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EXPERIMENTS ON THE USE OF N-NITROSO-N-ALKYLUREAS IN THE BREEDING OF CHABAUD CARNATIONS (M_2—M_3)

HELMI VÕSAMÄE, KALJU KASK. N-NITROSO-N-ALKÜÜLKARBAMIIDIDE KASUTAMINE SABOONELGI ARETUSES (M_2-M_3 PÕLVKOND)

ХЕЛЬМИ ВЫСАМЯЭ, КАЛЬЮ КАСК. СЕЛЕКЦИЯ ГВОЗДИКИ ШАБО С ПРИМЕНЕНИЕМ N-НИТРОЗО-N-АЛКИЛМОЧЕВИН (M_2—M_3)

The use of induced mutations may have a good prospect in the ornamental plant breeding.

In our experiments, seeds of a single plant of the carnation Chabaud variety No. 24 have been used. This variety was selected by A. Süvalepp, and multiplied before the beginning of the experiments under our control for 13 years. The variety No. 24 is characterized by large flowers of up to 7.5 cm in diameter, of a beautiful shape and light-pink colour. Considerable variations (twisting, etc.) were observed in leaf shape, due to cross-pollination. The colour of the flowers had changed in up to 10 per cent of cases. We have to note here that the commercially available carnation seeds in France and USA have usually a considerably greater rate of variation in the properties of seedlings. The air-dry seeds in our experiments were treated with water solutions of nitroso ethylurea (NEU) in concentrations of 1, 2 and 9 mM, nitroso methylurea (NMU) in concentrations of 0.5, 1 and 2.5 mM, and with distilled water (control). The volume of the mutagen solution was ten times as large as the volume of the seeds. All the treatments were administered for 24 hours at room temperature. The treated and control seeds were washed in running tap water for 1 hour and then dried until they obtained the original moisture content. It has been found that the redrying of barley seeds after the post-treatment washing has only a small influence on the mutagenic activity of NEU and NMU (Gichner et al., 1968).

Table 1

Percentage of individual plants (A) and families (B) with a changed flower colour (original colour — light-pink) after NEU and NMU treatments

Mutagen	Concentration mM	Progeny	Number of families	Number of plants	Light-pink A	Light-pink B	Dark-pink A	Dark-pink B	Pink A	Pink B	Carmine pink A	Carmine pink B	White A	White B	Other colours A	Other colours B
NEU	1	M_2	108	720	92.0	59.3	0.3	1.9	4.4	22.2	0.4	2.8	2.6	13.9	0.3	1.9
		M_3	13	441	89.2	38.5	3.9	15.4	2.2	38.5	1.1	15.4	2.5	30.8	1.1	15.4
	2	M_2	61	409	91.5	62.3	3.9	18.0	2.7	16.4	0.5	3.3	1.2	8.2	0.2	1.6
		M_3	12	555	93.7	25.0	3.6	66.7	0.5	16.7	1.3	25.0	0.9	16.7	0	0
NMU	0.5	M_2	2	9	78	0	22	100	0	0	0	0	0	0	0	0
		M_3	2	20	75	0	20	100	0	0	5	50	0	0	0	0
	1	M_2	1	10	100	100	0	0	0	0	0	0	0	0	0	0
		M_3	2	63	56	0	27	100	6	100	0	0	11	50	0	0
	2.5	M_2	1	35	3	0	91	100	6	100	3	0	0	0	0	0
		M_3	5	215	24.7	0	47.4	100	22.8	80	0.5	20	4.6	20	0	0
Control		M_2	40	280	90.9	55.0	2.9	12.5	3.9	25.0	0.4	2.5	1.9	7.5	0	0
		M_3	12	249	92.0	42	5.6	42	0.4	8	0.8	17	0.4	8	0.8	17

Table 2

Germination percentage in M_2—M_4 after NEU and NMU treatments

Progeny	Concentration of NEU, mM		Concentration of NMU, mM			Control
	1	2	0.5	1	2.5	
M_2	80	77	23—60	65	95	89
M_3	91	93	15—54	77	84	93
M_4	84	91	75	86	88	87

A month after the treatment, the seeds were sown in five repeats in a cold greenhouse (Каск и др., 1970). The number of families and plants in M_2 and M_3 populations are given in Table 1. On the whole, the parent plants for sowing M_3 and the following generations were selected on the basis of their prominent characters (large well-shaped flowers, a great number of flowers, high seed yield).

9 mM NEU led to the total perishing of germs in M_1. With the concentrations of 1 and 2 mM the germination in M_2—M_4 was the same as in the control, or slightly lower (Table 2). The other mean characters of seedlings did not differ considerably from the control ones (Table 3), except the greater height of plants with the concentration of 1 mM (including the M_1). In M_3 some more families were observed with a changed colour of flowers — dark-pink, pink and white (Table 1).

2.5 mM NMU appeared to be almost lethal in M_1; but a single plant happened to grow to maturity, the germination of the seeds of that plant being in M_2—M_4 the same as in the control. The progenies of that plant had an especially large variability of flower-colouring (Table 1).

Table 3

Percentage of sterile plants, mean plant height, total amount of flowers and flower buds, and seed yield of carnation Chabaud after NEU and NMU treatments

Mutagen	Concentration, mM	Progeny	Completely sterile plants, %	Height, cm	Amount of flowers and flower buds	Seed yield, g
NEU	1	M_2	8.6	87	18	0.49
		M_3	18.7	87	19	0.33
	2	M_2	8.6	84	19	0.46
		M_3	17.5	84	18	0.34
NMU	0.5	M_2	11.1	70	13	0.18
		M_3	12.0	79	20	0.38
	1	M_2	40.0	81	15	0.21
		M_3	33.3	85	19	0.24
	2.5	M_2	17.7	86	16	0.51
		M_3	27.9	85	18	0.37
Control		M_2	6.8	83	19	0.66
		M_3	10.8	82	19	0.38

The seed germination in the M_1 generation with the concentrations of 1 and 0.5 mM NMU was satisfactory, but because of the high sterility only 51 seeds were obtained from 3 plants. In M_2 and M_3 the germination of seeds in these variants was considerably lower than in the control.

NMU (1 and 2.5 mM) caused a high sterility in M_2 and M_3, as well (Table 3). In some cases (0.5 and 1 mM) the seed yield and weight was substantially reduced in M_2. Changes in the colour of the flowers in M_2—M_3 were frequently observed after a treatment with NMU.

In spite of the heavy reduction of the breeding material after a treatment with high concentrations of NMU, we have got a great number of carnation seedlings with prominent characteristics, which may prove of use for breeding purposes in the future.

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