ECOLOGY

Sanative Effect of Volatile Compounds Produced by Intact Common Myrtle *Myrtus communis L.* in Interiors

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It is shown that volatile compounds (phytoncides) produced by common myrtle have a bactericidal effect on facultatively pathogenic air microflora and can be used for natural sanitization of facilities.

Key Words: *phytodesign; common myrtle; phytoncides; bactericides*

Plants producing volatile compounds that suppress pathogenic air microflora (phytoncides) and have a beneficial effect on health can improve human habitations. Phytoncides can be applied as aerosols; however, phytodesign (the use of plants for improving the environment) is a new trend which deserves further development.

The combination of ornamental plants with plants giving off bactericidal compounds makes it possible to solve esthetic and therapeutic problems (aesthetotherapy and phytoncidotherapy) at one and the same time.

Plants from the myrtle family, including common myrtle, whose therapeutic and aromatic properties have long been known, are most promising candidates for phytodesign. The bactericidal effect of extracts from myrtle leaves was demonstrated by Dr. G. P. Degtyareva. The effects of volatile compounds on pathogenic and facultatively pathogenic air microflora have not been studied, and few species from the myrtle family have been used in interior phytodesign.

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Previously, with the use of experimental boxes it was shown that under the action of phytoncides produced by myrtle the numbers of sarcinae, bacilli, and micrococci in the air drop almost twofold [1].

In the present study the sanative effect of volatile compounds of common myrtle in facilities was studied.

MATERIALS AND METHODS

The sanative effect of myrtle was evaluated from the number of microorganisms in the air (ten determinations) in the absence and in the presence of the plant. To obtain reliable results we used two schemes: a comparison of the values obtained in the presence and in the absence of myrtle and a comparison of the values obtained in parallel in two identical hospital wards (control and experimental).

The antibacterial effect of myrtle was evaluated from the relative decrease in the number of microorganisms, which was calculated from the following formula: $A=[(C-E)/C]\times 100\%$, where C and E are the numbers of microorganisms in the control and experiment, respectively.

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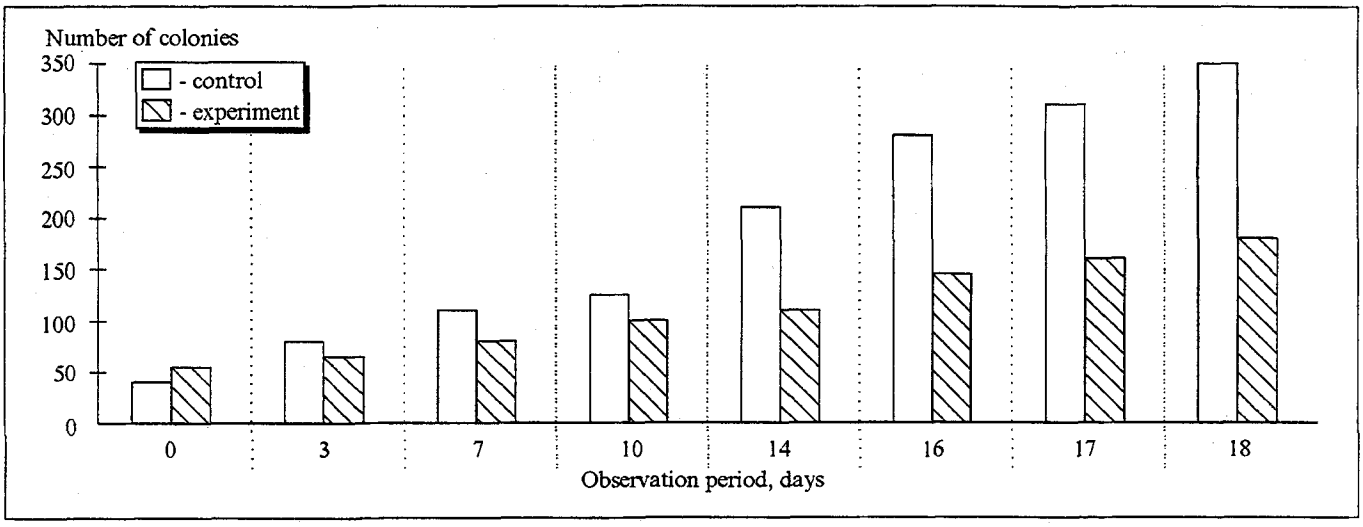

Fig. 1. Microbial contamination of the air in wards of the clinic of the Institute of Human Ecology and Pathology (Siberian Division of the Russian Academy of Medical Sciences).

RESULTS

Investigation according to the first scheme was carried out in the playrooms of two kindergartens in the city of Novosibirsk. The volume of the first room (kindergarten No. 430) was 216 m^3, the volume of the second (kindergarten No. 493) was 100 m^3. The levels of bacterial contamination of the air were measured. Control measurements were the mean weekly levels of air contamination in the absence of plants. Seven 3- or 4-year-old myrtles with a total foliage area of about 1.3 m^2 were placed in the rooms.

Within a week of installing the plants, bacterial contamination decreased by 40-50% and remained at this level during a 30-day period (Table 1).

Intact plants had a partial bactericidal effect on the air microflora which varied depending on its type (*Sarcina, Bacillus, Micrococcus,* or *Staphylococcus)* (Table 1).

The disadvantage of this scheme is that variations of the degree of bacterial contamination during the experiment can be caused by various accessory factors (temperature, amount of illumination, etc.). According to the second scheme, the control and experimental measurements were made in parallel. Experiments were performed in two wards (each with a volume of 36 m^3) at the clinic of the Institute of Human Ecology and Pathology (Siberian Division of the Russian Academy of Medical Sciences). Week-long measurements showed that in

TABLE 1. Changes in the Level of Microbial Contamination of the Air in Playrooms under the Action of Phytoncides of Common Myrtle

Microorganism	Control	Days of observation					
		3 days		7 days		30 days	
	number of colonies	number of colonies	*A*, %	number of colonies	*A*, %	number of colonies	*A*, %
Kindergarten No. 430							
Sarcina	17±2	15±2	12	10±2	40	11±2	35
Bacillus	8±1	7±1	12	4±1	50	3±0.5	63
Micrococcus	5±1	4±1	20	2±0.5	60	2±0.5	60
Staphylococcus	21±3	19±3	10	15±2	29	8±1	62
Total	76±10	57±5	25	34±3	55	35±4	54
Kindergarten No. 493							
Sarcina	44±3	27±3	38	25±3	43	15±2	66
Bacillus	25±3	9±1	64	11±2	56	7±1	71
Micrococcus	4±1	3±1	25	3±0.5	25	2±0.5	50
Staphylococcus	28±4	22±3	21	11±2	61	12±1	57
Total	102±8	66±6	35	62±4	39	55±4	46

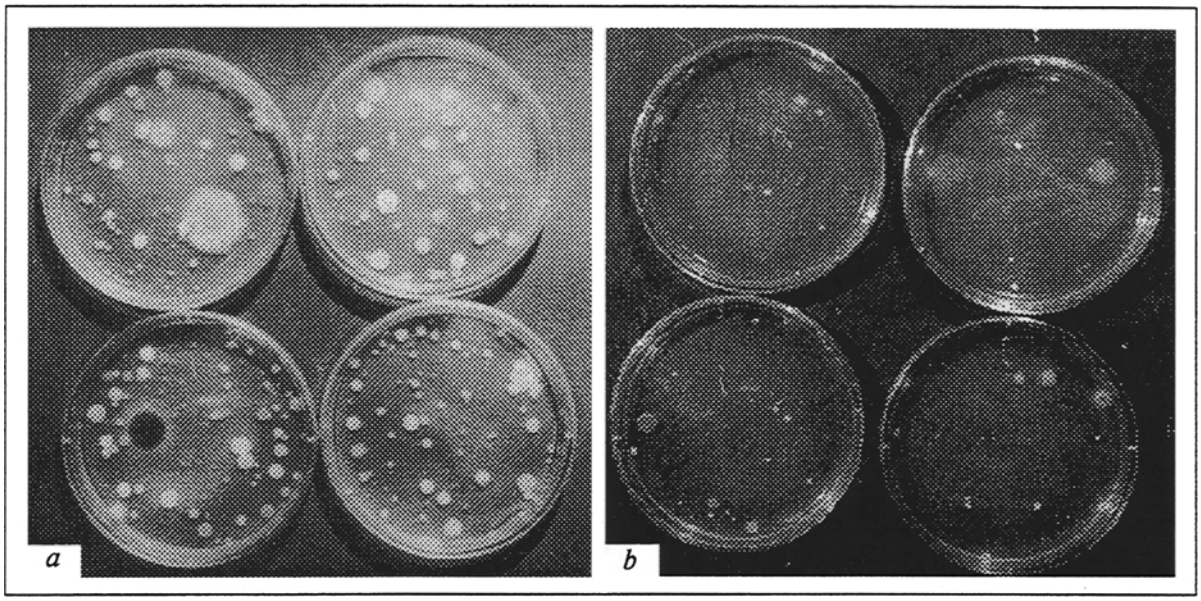

Fig. 2. Colonies of air bacteria (sedimentation technique) in two wards of the clinic 7 days after myrtle plants had been placed in the experimental ward. Control (*a*) and experimental (*b*) wards.

the absence of plants the level of air contamination in both wards was practically the same. After myrtles were installed (three 4-year-old plants with a total foliage area of 0.752 m^2), the level of microbial contamination was measured seven times during an 18-day period. Figure 1 is an integral characteristic of air contamination: each subsequent value is the total of the preceding values plus the level on the day of measurement. This characteristic allowed us to disregard certain uncontrollable factors affecting the level of microbial contamination (new patients, cleaning, etc.) and to trace the dynamics of bacterial contamination in the control and experimental wards. Starting from day 3, the level of microbial contamination in the experimental ward was lower than in the control (Fig. 1). Far fewer colonies grew from the air in the experimental ward than in the control (Fig. 2, *a*, *b*). The total microbial count for 18 days was 50% of the control level (Fig. 1, shaded bars). These data are consistent with those obtained in the kindergartens and in laboratory experiments. A 50% sanative effect in facilities is provided by myrtles with a foliage area of 0.6-1.5 m^2 per 100 m^3.

The Department of Pediatrics (Novosibirsk Medical Institute) performed a parallel study to evaluate the preventive effect of the phytoncides of common myrtle on acute respiratory diseases. Analysis showed that enrichment of the air with these phytoncides results in a 30% decrease in the incidence and a 51-57% decrease in the duration of disease. The general resistance of children markedly increased. There were no allergic reactions. The effect was most pronounced in January-March, when myrtle grows actively. Presumably, the phytoncides produced by myrtle have an antimicrobial effect on the causative agents of respiratory diseases.

Thus, myrtles grown in facilities (child-care institutions, hospitals and living quarters) markedly reduce the incidence of acute respiratory diseases and suppress the foci of chronic infection.

REFERENCES

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