

*HUMAN PHYTOREHABILITATION*

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**ESSENTIAL OIL OF *EUCALYPTUS* AND ITS EFFECT ON PSYCHOPHYSIOLOGICAL STATE OF PEOPLE BREATHING IT IN DIFFERENT CONCENTRATION DURING EXERCISE****Timur Rustemovich Bekmambetov<sup>1</sup>, Valentina Valeriyevna Tonkovtseva<sup>1</sup>, Natalia Ivanovna Litvinchuk<sup>2</sup>, Aleksandr Mikhailovich Yarosh<sup>1</sup>**Nikita Botanical Gardens – National Scientific Centre  
298648, Republic of the Crimea, the city of Yalta, urb.vil. Nikita[valyalta@rambler.ru](mailto:valyalta@rambler.ru)<sup>2</sup>Dance school “Ariadna”, Simferopol[aridancers@gmail.com](mailto:aridancers@gmail.com)**Introduction**

Essential oil (EO) of *Eucalyptus* (*Eucalyptus globulus*, *Eucalyptus cinerea*, *Eucalyptus viminalis*) is mainly used as antiseptic and anti-inflammatory remedy [4]. But at the same time it affects on nervous system as well [5]. It was demonstrated that breathing eucalyptus EO of 1 mg/m<sup>3</sup> during rest time, it improves psychoemotional state and has a hypotensive and bradycardial effect [3].

Objective of this work is to investigate effect of eucalyptus EO being in different concentrations on some functions of human central nervous system and cardiovascular system during exercise.

**Objects and methods**

A group of 20 women aged by 20-50 was involved into this study. Control one was similar group by composition and size. 90-minute exercise at eastern dances was chosen as a physical load. In a control group the exercise was held without extra effects. People of experimental group could breath *Eucalyptus* EO of the following concentrations: 0,5; 1,0 or 2,0 mg/m<sup>3</sup>.

WAM (well-being, activity, mood) test was to assess EO effect on nervous system [1, 2], for cardiovascular system we measures heart rate (HR), systolic (BPS) and diastolic (BPD) blood pressure.

Nervous system parameters were tested before and after exercise, cardiovascular system – before and after exercise and 15 minutes later.

Findings were processed statistically applying t-criterion by Student for associated and independent sampling.

**Results and discussion**

According to parameter of WAM test initially experimental group, having done exercise under influence of *Eucalyptus* EO, 2,0 mg/m<sup>3</sup>, and control group didn't have any reliable differences (table 1).

After exercise without extra effect of *Eucalyptus* EO (control group) there was a reliable improvement of general condition, mood and rise of vivacity . That is dance session demonstrates euphoric effect.

Atmosphere concentrated with eucalyptus EO provoked reliable increasing of the most study parameters, besides vivacity and attentiveness. These both parameters had a

tendency to improve. On the whole dance session held with *Eucalyptus* EO, 2,0 mg/m<sup>3</sup>, resulted improvement of psychoemotional state of tested people like it was in a control group.

Table 1

**Effect of *Eucalyptus* EO, 2,0 mg/m<sup>3</sup>, on psychoemotional state of tested people (test WAM parameters, standard units)**

| Parameter                         | Experimental group initially | Control group initially | Experimental group after procedure | Pex b/a< | Control group after procedure | Pc b/a< |
|-----------------------------------|------------------------------|-------------------------|------------------------------------|----------|-------------------------------|---------|
| General condition                 | 148,60<br>±4,27              | 144,75<br>±7,85         | 162,40<br>±4,61                    | 0,003    | 153,30<br>±5,94               | 0,02    |
| Well-being                        | 147,15<br>±6,64              | 142,65<br>±8,83         | 161,60<br>±4,50                    | 0,04     | 152,35<br>±7,02               | 0,05    |
| Mood                              | 144,30<br>±6,71              | 150,45<br>±6,76         | 172,40<br>±5,14                    | 0,000002 | 160,95<br>±4,79               | 0,003   |
| Weakness - capacity to work       | 134,65<br>±6,42              | 140,10<br>±8,02         | 150,75<br>±5,96                    | 0,02     | 141,35<br>±6,51               | 0,84    |
| Tension – relaxation              | 142,30<br>±5,69              | 134,30<br>±4,89         | 154,70<br>±4,97                    | 0,03     | 143,45<br>±6,59               | 0,20    |
| Inertness –vivacity               | 133,85<br>±6,19              | 128,70<br>±8,01         | 147,80<br>±5,89                    | 0,06     | 145,05<br>±6,62               | 0,01    |
| Absent-mindedness – attentiveness | 133,05<br>±5,40              | 129,70<br>±7,91         | 144,10<br>±5,09                    | 0,07     | 139,80<br>±5,18               | 0,11    |

Experimental group, being under effect of eucalyptus EO, 1,0mg/m<sup>3</sup> and control group didn't have any reliable differences (table 2).

Table 2

**Effect of *Eucalyptus* EO, 1,0 mg/m<sup>3</sup>, on psychoemotional state of tested people (test WAM parameters, standard units)**

| Parameter                         | Experimental group initially | Control group initially | Experimental group after procedure | Pex b/a< | Control group after procedure | Pc b/a< | Pex/c after< |
|-----------------------------------|------------------------------|-------------------------|------------------------------------|----------|-------------------------------|---------|--------------|
| 1                                 | 2                            | 3                       | 4                                  | 5        | 6                             | 7       | 8            |
| General condition                 | 150,65<br>±7,11              | 157,30<br>±5,16         | 176,84<br>±4,94                    | 0,0001   | 162,65<br>±5,13               | 0,02    | 0,1          |
| Well-being                        | 155,40<br>±8,87              | 157,50<br>±4,93         | 183,93<br>±5,60                    | 0,0007   | 164,85<br>±4,54               | 0,01    | 0,05         |
| Mood                              | 161,60<br>±5,85              | 166,35<br>±4,37         | 185,37<br>±3,71                    | 0,00002  | 169,95<br>±3,37               | 0,003   | 0,01         |
| Weakness - capacity to work       | 149,70<br>±10,51             | 151,80<br>±5,87         | 182,65<br>±5,91                    | 0,0005   | 152,75<br>±5,74               | 0,37    | 0,01         |
| Tension – relaxation              | 136,00<br>±5,70              | 132,00<br>±5,10         | 152,85<br>±5,18                    | 0,0001   | 149,70<br>±6,25               | 0,09    |              |
| Inertness – vivacity              | 137,50<br>±11,41             | 141,05<br>±6,67         | 175,71<br>±7,63                    | 0,0002   | 155,50<br>±4,55               | 0,004   | 0,05         |
| Absent-mindedness – attentiveness | 142,50<br>±9,11              | 144,30<br>±5,65         | 172,86<br>±6,74                    | 0,0007   | 144,80<br>±4,14               | 0,05    | 0,01         |

After exercise without essential oil (control group) reliable rise of general condition, well-being, mood, vivacity and attentiveness was registered. Tension tended to decrease.

After dance session held in a room concentrated with *Eucalyptus* EO (experiment group), 1,0 mg/m<sup>3</sup> there was a pronounced improvement of all study parameters: general

condition, well-being, mood, capacity to work, vivacity, attentiveness, tension. In this case finite value of well-being, mood, capacity to work, vivacity, attentiveness in experimental group was higher than in control group; general condition kept the tendency of increasing.

Otherwise dance session held in the room concentrated with *Eucalyptus* EO, 1,0 mg/m<sup>3</sup> resulted pronounced and much more emphasized improvement of human psychoemotional state in comparison with control group.

Investigating effect of *Eucalyptus* EO of 0,5 mg/m<sup>3</sup> according to WAM test, both groups didn't have any reliable differences (table 3).

Table 3

**Effect of *Eucalyptus* EO, 0,5 mg/m<sup>3</sup>, on psychoemotional state of tested people (test WAM parameters, standard units)**

| Parameter                         | Experimental group initially | Control group initially | Experimental group after procedure | P <sub>ex</sub> b/a< | Control group after procedure | P <sub>c</sub> b/a< |
|-----------------------------------|------------------------------|-------------------------|------------------------------------|----------------------|-------------------------------|---------------------|
| General condition                 | 154,25<br>±5,93              | 157,30<br>±5,16         | 161,55<br>±6,19                    | 0,01                 | 162,65<br>±5,13               | 0,12                |
| Well-being                        | 154,80<br>±5,66              | 157,50<br>±4,93         | 163,70<br>±5,46                    | 0,001                | 164,85<br>±4,54               | 0,02                |
| Mood                              | 160,25<br>±6,06              | 166,35<br>±4,37         | 169,10<br>±5,86                    | 0,0003               | 169,95<br>±3,37               | 0,13                |
| Weakness –capacity to work        | 146,15<br>±5,90              | 151,80<br>±5,87         | 149,95<br>±4,73                    | 0,47                 | 152,75<br>±5,74               | 0,91                |
| tension – relaxation              | 138,45<br>±4,48              | 132,00<br>±5,10         | 156,10<br>±5,89                    | 0,002                | 149,70<br>±6,25               | 0,04                |
| Inertness – vivacity              | 140,35<br>±6,72              | 141,05<br>±6,67         | 146,15<br>±6,49                    | 0,18                 | 155,50<br>±4,55               | 0,05                |
| Absent-mindedness – attentiveness | 142,30<br>±7,15              | 144,30<br>±5,65         | 149,29<br>±6,32                    | 0,18                 | 144,80<br>±4,14               | 0,94                |

After exercise without essential oil (control group) there was a reliable rise of well-being, vivacity and slowdown of tension.

After dance session with essential oil (experimental group) a reliable improvement of general condition, well-being and mood was fixed, while level of tension went down. At the same time finite values of parameters in both groups are close.

On the whole dance session held in the room concentrated with *Eucalyptus* EO, 0,5mg/m<sup>3</sup> didn't result significant improvement of psychoemotional state in comparison with value of control group.

While studying effect of *Eucalyptus* EO, 2,0 mg/m<sup>3</sup>, on cardiovascular system initially (before procedure) there weren't any reliable differences between values of BP and HR in control and experimental groups (table 4). In this case in both groups average values of BPS and BPD were normal by JNC6, HR – higher.

After dance session without EO (control group) values of BPS and BPD didn't change, HR had a reliable rise, and 15 minutes later became as it was initially.

Value of HR raised for certain, 15 minutes later slowdown back. *Eucalyptus* EO of 2,0mg/m<sup>3</sup> didn't have any effect on cardiovascular system.

Table 4

Effect of *Eucalyptus* EO, 2,0mg/m<sup>3</sup> on blood pressure (mm of mercury) and heart rate (bpm) during exercise

| Parameter                        | Before procedure | After procedure | P<   | In 15 min after procedure | Before proced. / in 15 min after procedure P< | After procedure. / in 15 min after procedure P< |
|----------------------------------|------------------|-----------------|------|---------------------------|---|---|
| <b>BPS</b><br>Experimental group | 123,90<br>±2,47  | 122,80<br>±1,80 | 0,62 | 123,30<br>±2,19           | 0,75  | 0,85  |
| <b>BPS</b><br>Control group      | 126,25<br>±3,73  | 129,10<br>±3,58 | 0,43 | 126,25<br>±3,49           | 1,00  | 0,34  |
| <b>BPD</b><br>Experimental group | 80,80<br>±1,83   | 82,55<br>±1,42  | 0,24 | 82,65<br>±1,64            | 0,27  | 0,94  |
| <b>BPD</b><br>Control group      | 83,25<br>±2,54   | 85,70<br>±1,28  | 0,14 | 85,45<br>±2,05            | 0,15  | 0,86  |
| <b>HR</b><br>Experimental group  | 85,45<br>±3,03   | 93,00<br>±3,16  | 0,03 | 89,20<br>±2,33            | 0,13  | 0,08  |
| <b>HR</b><br>Control group       | 86,85<br>±3,18   | 95,80<br>±3,69  | 0,03 | 88,00<br>±3,31            | 0,74  | 0,001   |

While studying effect of *Eucalyptus* EO, 1,0 mg/m<sup>3</sup> on cardiovascular system it was found out that initially BPS and BPD in both groups were between normal and high values by JNC6, HR was higher. Certain differences between initial values of BP and HR weren't fixed either in control group or in experimental one (table 5).

After dance session without essential oil (control group) value of BPS didn't change, BPD tended to increase. Value of HR rose for certain. In 15 minutes after dance class BP was on the same level as it was registered just after exercise, HR value turned back.

In the experimental group after dance session in the room concentrated with *Eucalyptus* EO BPS decreased, while BPD was kept on the same level. In 15 minutes after dance class BPS value was the same as just after exercise and lower in comparison with initial data. Values of BPD didn't differ much from initial and values just after dance class. HR value just after dance increased and in 15 minutes it went down, but tended to rise in comparison with initial data.

Table 5

Effect of *Eucalyptus* EO, 1,0 mg/m<sup>3</sup> on blood pressure (mm by mercury) and heart rate (bpm) during exercise

| Parameter                        | Before procedure | After procedure | P<    | In 15 min after procedure | Before proced. / in 15 min after procedure P< | After procedure. / in 15 min after procedure P< |
|----------------------------------|------------------|-----------------|-------|---------------------------|---|---|
| <b>BPS</b><br>Experimental group | 130,10<br>±4,21  | 122,90<br>±2,88 | 0,03  | 123,80<br>±3,93           | 0,04  | 0,70  |
| <b>BPS</b><br>Control group      | 132,05<br>±5,04  | 131,20<br>±3,84 | 0,83  | 128,95<br>±3,88           | 0,47  | 0,40  |
| <b>Pex/c</b>                     | >0,1             | <0,1            | -     | >0,1                      | -   | -   |
| <b>BPD</b><br>Experimental group | 86,15<br>±2,49   | 85,60<br>±2,51  | 0,60  | 82,60<br>±3,03            | 0,06  | 0,08  |
| <b>BPD</b><br>Control group      | 84,55<br>±3,07   | 87,65<br>±2,52  | 0,09  | 87,45<br>±2,30            | 0,11  | 0,88  |
| <b>Pex/c</b>                     | >0,1             | >0,1            | -     | >0,1                      | -   | -   |
| <b>HR</b><br>Experimental group  | 80,20<br>±3,50   | 85,60<br>±3,70  | 0,04  | 83,75<br>±2,56            | 0,07  | 0,40  |
| <b>HR</b><br>Control group       | 83,45<br>±2,56   | 95,85<br>±3,81  | 0,004 | 88,15<br>±3,42            | 0,14  | 0,001   |
| <b>Pex/c</b>                     | >0,1             | <0,1            | -     | >0,1                      | -   | -   |

Investigating effect of *Eucalyptus* EO, 0,5mg/m<sup>3</sup> on cardiovascular system, initially values of BPS and BPD in both groups were normal by JNC6, but HR was higher. Certain differences of BP and HR values between control and experimental groups weren't fixed (table 6).

After dance session without EO (control group) values of BPS and BPD didn't differ from initial data for certain. HR after dance class increased and in 15 minutes was back.

In experimental group after dance session in the room concentrated with *Eucalyptus* EO values of BPS, BPD and HR increased significantly. In 15 minutes after dance class BPD and HR were back to initial data, BPS was kept heightened.

Table 6

Effect of *Eucalyptus* EO, 0,5 mg/m<sup>3</sup> on blood pressure (mm by mercury) and heart rate (bpm) during exercise

| Parameter                        | Before procedure | After procedure | P<    | In 15 min after procedure | Before proced. / in 15 min after procedure P< | After procedure. / in 15 min after procedure P< |
|----------------------------------|------------------|-----------------|-------|---------------------------|---|---|
| 1                                | 2                | 3               | 4     | 5                         | 6   | 7   |
| <b>BPS</b><br>Experimental group | 120,70<br>±2,38  | 128,95<br>±3,39 | 0,02  | 125,90<br>±2,91           | 0,04  | 0,18  |
| <b>BPS</b><br>Control group      | 126,25<br>±3,73  | 129,10<br>±4,50 | 0,43  | 126,25<br>±3,49           | 1,00  | 0,34  |
| <b>BPD</b><br>Experimental group | 80,40<br>±1,44   | 84,55<br>±1,66  | 0,002 | 80,90<br>±1,96            | 0,69  | 0,002   |
| <b>BPD</b><br>Control group      | 83,25<br>±2,54   | 85,70<br>±1,28  | 0,14  | 85,45<br>±2,05            | 0,15  | 0,86  |
| <b>HR</b><br>Experimental group  | 88,70<br>±3,07   | 99,95<br>±3,40  | 0,05  | 89,30<br>±2,85            | 0,85  | 0,05  |
| <b>HR</b><br>Control group       | 86,85<br>±3,18   | 95,80<br>±3,69  | 0,03  | 88,00<br>±3,31            | 0,74  | 0,001   |

As a result it can be noticed that dance classes as they are provoke euphoric effect. Extra euphoric effect given by *Eucalyptus* EO reveals itself in case of higher study concentrations – 2,0 and especially 1,0 mg/m<sup>3</sup>.

Influence of *Eucalyptus* EO on cardiovascular system is insignificant, varied and becomes apparent for account of BP and HR in case of lower study concentrations.

### Conclusions

1. *Eucalyptus* EO provokes euphoric effect, that is pronounced during prolonged and medium exercise load in case of higher study concentrations only – 1,0 and 2,0 mg/m<sup>3</sup>.
2. Effect of *Eucalyptus* EO on cardiovascular system is insignificant.

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**Bekmambetov T.R., Tonkovtseva V.V., Litvinchuk N.I., Yarosh A.M. Essential oil of *Eucalyptus* and its effect on psychophysiological state of people breathing it in different concentration during exercise // Bull. of the State Nikit. Botan. Gard. – 2015. – № 117. – P. 11 – 17.**

Essential oil of *Eucalyptus* provokes euphoric effect during prolonged medium exercise; on the background of physical activity it is pronounced only in case of the highest study concentrations – 1,0 and 2,0 mg/m<sup>3</sup>. Effect of *Eucalyptus* essential oil on cardiovascular system is insignificant and varied.

**Key words:** *essential oil, Eucalyptus, eastern dances, exercise load, psychoemotional state, WAM test, nervous system, cardiovascular system.*

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## **ESSENTIAL OIL OF *SYZYGIUM AROMATICUM* AND ITS EFFECT ON PSYCHOPHYSIOLOGICAL STATE OF PEOPLE BREATHING IT IN DIFFERENT CONCENTRATION DURING EXERCISE**

**Timur Rustemovich Bekmambetov<sup>1</sup>, Valentina Valeriyevna Tonkovtseva<sup>1</sup>,  
Natalia Ivanovna Litvinchuk<sup>2</sup>, Aleksandr Mikhailovich Yarosh<sup>1</sup>**

Nikita Botanical Gardens – National Scientific Centre  
298648, Republic of the Crimea, the city of Yalta, urb.vil. Nikita  
[valyalta@rambler.ru](mailto:valyalta@rambler.ru)

<sup>2</sup>Dance school “Ariadna”, Simferopol  
[aridancers@gmail.com](mailto:aridancers@gmail.com)

### **Introduction**

Essential oil (EO) of *Syzygium Aromaticum* L. possesses neuroprotective, neurostimulating and tonic properties [5, 6]. It was demonstrated that breathing *Syzygium Aromaticum* L. EO of 1 mg/m<sup>3</sup> during rest time, it improves general state, well-being, mood and reduces anxiety and tension level, strengthens sense of vivacity, elation and attentiveness. BPD reduction was not much but significant, HR tended to decrease [2].

Objective of this work is to investigate effect of *Syzygium Aromaticum* L. EO being in different concentrations on some functions of human central nervous system and cardiovascular system during exercise.

### **Objects and methods**

A group of 20 women aged by 20-50 was involved into this study. Control one was similar group by composition and size. 90-minute eastern dance class was chosen as a physical load. In a control group the exercise was held without extra effects, while people of experimental group could breath *Syzygium Aromaticum* L. EO of the following