

The effect of aromatherapy on mental, physical symptoms, and social functions of females with premenstrual syndrome: A randomized clinical trial

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ABSTRACT

Objective: This study was designed to compare the effect of aromatherapy with Rosa Damascena and Citrus Aurantium blossom on psychological and physical symptoms and social functions of females with premenstrual syndrome. **Materials and Methods:** This double-blind clinical trial was conducted on 95 students. They were randomly divided into three aromatherapy groups (aromatherapy with 4% concentration of Rosa Damascena and 0.5% concentration of Citrus Aurantium blossom essential oil) and aromatherapy with sweet almond oil (as control group). Premenstrual Symptoms Screening Tool questionnaire (PSST) was completed before and during the first and second month of the intervention. Data were analyzed by SPSS software version 22. **Results:** After intervention, the scores of mental symptoms decreased in all three groups and this decrease was significant in both Citrus Aurantium ($P = 0.004$) and Rosa Damascena groups ($P = 0.007$). The score of physical symptoms was decreased in all three groups but it was significant only in the Rosa Demecensa group ($P = 0.042$). The reduction of effect of symptoms on social function was observed in two intervention groups which were significant only in Rosa Damascena group ($P < 0.001$). **Conclusion:** Essential oils of Rosa Damascena and Citrus Aurantium were both effective in improving the symptoms of premenstrual syndrome but the effect of Rosa Damascena, with regard to improvement of symptoms of premenstrual syndrome was more than that of Citrus Aurantium in all psychological, physical, and social aspects.

Keywords: Aromatherapy, Citrus Aurantium, female, premenstrual syndrome, Rosa Damascena

Introduction

About 30–80% of women of reproductive ages experience a series of physical and mental symptoms in their premenstrual periods

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that are called premenstrual syndrome (PMS).^[1] This condition can affect the person's behavior, health, and relationships.^[2] Reasons such as the effects of sex hormones on gamma-amino butyric acid and serotonin^[3] and decreased parasympathetic activity^[4] are among the causes of this syndrome. One of the several therapeutic methods that have been recommended for this syndrome is complementary and alternative medicine (CAM).^[5]

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Aromatherapy such as *Rosa Damascena* and *Citrus Aurantium* scent has been used from the past till present by women for their health and lifestyle improvement and considered as an effective and safe method.^[2] In this method, volatile essential oils of plants are used to improve physical, spiritual, and mental health^[6] and the effect of this method on disorders, such as depression, anxiety, pain, fatigue, and nausea and vomiting are indicated.^[7] In Persian medicine, *Rosa damascene* has been used to treat various disorders, such as menstrual disorders, gynecologic disorders, sexual dysfunction, and mental disorders.^[8,9] studies have also shown it is hypnotic, anticonvulsant, antidepressant, antianxiety, and analgesic effects^[8] which is due to its strong depressing effect on the central nervous system^[9] and so far no side effects have been reported.^[10] *Citrus Aurantium* is traditionally used in some parts of the world as antianxiety, anticonvulsant, sleep disturbance remover, and central nervous system activity reducer.^[11] Its brownish yellow essential oil called *Neroli* is obtained from the distillation of the new blossoms of the plant.^[12] Nowadays, the effects of oral or inhaler type of this plant on anxiety, sleep, seizure, and menopausal symptoms have been investigated in numerous studies.^[11,13,14]

Over the past decade, the use of complementary and alternative drugs has been increased to treat the problems of various groups of society, especially women, such as menopause, premenstrual syndrome, and sexual illness.^[15-20] The familiarity of the medical team and the research team has become even more prominent in this regard.

Therefore, considering the impact of premenstrual syndrome on individual and social functions of students, it seems necessary to address this issue. On the contrary, an important part of the symptoms of this syndrome is mood and behavioral symptoms. Moreover, *Rosa Demecensa* and *Citrus Aurantium* have been used in Iran and some other countries from the past for the treatment of various disorders including reproductive system disorders and mental health. Therefore, the present study was conducted to compare the effects of aromatherapy with *Rosa Demecensa* and *Citrus Aurantium* blossom essential oil on the premenstrual syndrome in students.

Methodology

Samples

In this double-blind clinical trial conducted in March 2016 to February 2017, 95 students of Shiraz University of Medical Sciences participated. This study has been recorded in the Iranian registry of clinical trials (IRCT2016031113940N3) and it is confirmed by Ethics Committee of the Shiraz University of Medical Sciences (Ethic No: Ir.sums.rec. 1394.163). Informed written consent was completed. First, 168 students completed three-part questionnaires including questionnaire of demographic information and physical characteristics, Goldberg General Health Questionnaire (GHQ) to assess the mental health of the samples and the PSST to determine the existence of PMS and its severity (for two consecutive menstrual cycles).

Since sample size estimated as 99 based on similar studies^[14] and considering the error of 0.05, the test power of 0.8 and taking into account the loss of 10% using NCSS software and following formula, then researchers selected 99 students using a simple random equation to put them equally in to two intervention and control groups.

$$n_1 = n_2 = \frac{Z S_p^2 (\alpha_1 - \alpha/2)^2}{(\mu_1 - \mu_2)}$$

Inclusion criteria were tendency to participate in study, having a GHQ score below 23, a PSST score over 20 and having moderate to severe premenstrual syndrome, not taking vitamin supplements at the time of entering the study, not taking hormonal drugs at least 2 months before the study, the length of the menstruation from 24 to 35 days and no underlying mental and physical disorders. Exclusion criteria were unwillingness to continue the participation in the study, occurrence of stressful event, and the use of any other drug during the study, changes in menstrual cycle intervals and period versus including criteria, and sensitivity to the essential oils used in the study.

Interventions

In this study, two types of aromatherapy were used, one of them was aromatherapy with essential oils of Rose with a concentration of 4% and the other one was aromatherapy with essential oils of *Citrus Aurantium* blossom at 0.5% concentration and sweet almond oil as placebo for control group. Samples in the luteal phase of their menstrual cycle were studied by using the same method. In this method, about 1 week before menstruation (for 5 days), the samples were placed in a constant and comfortable position twice a day in two consecutive cycles, each time for 5 min They poured ten drops of essential oil on an eye pad and placed it at a distance of 30 cm from the nose and inhaled in for 5 min with normal breathing.^[14] Then, at the end of intervention, they completed PSST again.

Essential oils used in this study obtained from pure essential oils of Barij Essence and Adonis Gol Darou pharmaceutical companies and prepared at desired concentrations for groups by the Department of Pharmacology, Faculty of Medicine, Shiraz University of Medical Sciences, in 5 ml bottles (required for one month) in the same bottle shape and color.

The study instruments

Demographic data questionnaire: it included age, marital status, height, weight, and body mass index and the length of menstruation and its intervals and history of disease or medication use.

Goldberg 28-item scaled version of the GHQ was used to examine anxiety and feelings of psychological disturbance, physical symptoms, social dysfunction, and depression. Likert scoring styles was used for scoring of this questionnaire in

which items A to D were dedicated to 0–3, respectively. In this method, the maximum test score will be 84.^[21] In a study, the sensitivity and specificity of this questionnaire were 86.5% and 82%, respectively. According to Likert scoring style, the cut of point reported as 23 that was significant at the 99% level.^[22]

PSST consists of 19 questions in two parts. 14 questions were related to mood, physical, and behavioral symptoms, and five questions was about the effect of symptoms on people's life. Questions graded from 0 to 3 based on severity of the symptoms. The scores of the questionnaire ranged from 0 to 57. In this study, individuals with moderate to severe premenstrual syndrome who had scores above 20 with the following three conditions were selected.

- 1) At least one moderate or severe option reported from questions 1–4 in the questionnaire.
- 2) At least four moderate or severe options indicated in questions 1–14 in addition to first part.
- 3) At least one moderate or severe option was in the five last questions.^[23]

In Iran, in one study (2013), its validity by obtaining CVR and content validity index (CVI) was 0.7 and 0.8 respectively and its reliability was confirmed by Cronbach's alpha of 0.93.^[24]

Data analysis method

Data analysis was performed using descriptive and analytical methods (analysis of variance, ANOVA and Tukey's tests) with SPSS software, V22. The significance level was considered as 0.05.

Results

This study was conducted on 95 female students. At the end of the study, four people were excluded from the study. Two subjects were from control group and one from the Citrus Aurantium aromatherapy group excluded due to their unwillingness to continue this study and one other subject excluded from aromatherapy group due to the use of vitamin supplements. Mean age of subjects was 22.33 ± 2.38 . Students GHQ mean score was 18.3 ± 3.59 . Based on ANOVA test, there were no significant differences between the three groups before intervention ($P = 0.055$).

Based on the ANOVA test, the difference in psychological symptoms score among all three groups is reduced. Tukey's test showed that in the second month of intervention, the psychological symptoms mean score was significantly decreased both in aromatherapy with Rosa Damascena ($P = 0.004$) and in the Neroli group ($P = 0.007$) and there was no difference between the two intervention groups ($P = 0.962$) [Table 1]. The difference in scores before and after intervention in all variables related to psychological symptoms was significant between the three groups except for the variables of anxiety, interest in work activities, and social activities and insomnia. The aromatherapy with Neroli compared to placebo significantly reduced the score of symptoms

Table 1: Comparison of mean differences of psychological and physical symptoms and effect of PMS on social activity between bitter orange blossom, Rose and control groups

Variable	Control	Bitter orange blossom	Rose	P*
Psychological	-1.32±3.88 ^{ab}	-3.83±5.36 ^a	-7.39±5.78 ^b	>0.001
Physical	-0.16±1.21 ^b	-0.93±2.22	-2.15±1.8 ^b	0.001>
Effect of PMS on social activity	1.12±2.82 ^b	-0.64±4.34	-2.06±3.42 ^b	0.003

*By using Oneway ANOVA test. a by using Tukey test, after intervention mean±SD between bitter orange and control group is significant. b by using Tukey test, after intervention mean±SD between rose and control group is significant. c by using Tukey test, after intervention mean±SD between rose and bitter orange group is significant.

Table 2: Comparison of mean differences of psychological symptoms between bitter orange, Rose, and control groups

Variable	Control	Bitter orange	Rose	P*
Anger/irritability	-.12±0.61 ^b	-0.48±0.85 ^c	-1±0.9 ^{bc}	<0.001
Anxiety/tension	-0.12±0.76	-0.38±0.71	-0.48±0.87	0.184
Tearful/increased sensitivity to rejection	0.16±0.77 ^{ab}	-.54±1.05 ^a	-0.66±1.05 ^b	0.002
Depressed mood/hopelessness	-0.19±0.79 ^b	-0.41±0.88	-0.84±1.17 ^b	0.026
Decreased interest in work activities	-0.19±1.01	-0.22±0.92	-0.66±0.88	0.084
Decreased interest in home activities	-0.32±1.07	-0.22±0.99	-0.78±0.78	0.045
Decreased interest in social activities	-0.22±0.66	-0.25±0.99	-0.69±0.91	0.059
Difficulty concentrating	-0.09±0.74 ^b	-0.38±0.95	-0.72±0.94 ^b	0.021
Feeling overwhelmed or out of control	0.03±0.75 ^a	-0.51±0.72 ^a	0.03±0.75	0.037

*By using one-way ANOVA test. ^aBy using Tukey's test, differences between bitter orange and control group is significant. ^bBy using Tukey's test, differences between Rose and control group is significant. ^cBy using Tukey's test, differences between Rose and bitter orange group is significant

such as Tearful/increased sensitivity to rejection ($P = 0.014$), feeling overwhelmed or out of control ($P = 0.028$). Aromatherapy with Rosa Damascena compared to placebo significantly reduced the anger/irritability ($P < 0.001$), tearful/increased sensitivity to rejection ($P = 0.003$), depression and hopelessness ($P = 0.022$), difficulty in the concentration ($P = 0.015$), and hypersomnia ($P = 0.004$). Therefore, both essential oils have been effective in tearful/increased sensitivity to rejection. Also, the effect of Rosa Damascena on anger/irritability ($P = 0.031$) and overweight ($P = 0.017$) was also significantly higher than that of Neroli [Table 2].

The score of physical symptoms decreased in all three groups but the mean score of physical symptoms in the second month of intervention was significant only in the group of Rosa Damascena compared to the control group ($P = 0.042$). There were no significant differences between the two intervention groups ($P = 0.412$) [Table 1]. Rosa Damascena had a significant effect on physical variables, such as fatigue and lack of energy ($P = 0.001$), breast tenderness, headache,

Table 3: Comparison of mean differences of physical symptoms between bitter orange, Rose, and control groups

Variable	Control	Bitter orange	Rose	P*
Fatigue/lack of energy	-0.12±0.76 ^b	-0.45±0.96	-0.9±0.8 ^b	0.002
Overeating/food craving	-0.22±0.88	-0.29±0.93	-0.51±1	0.437
Insomnia	-0.25±0.77	-0.29±0.93	-0.48±1.03	0.568
Hypersomnia	0.03±0.94 ^b	-0.09±1.04 ^c	-0.78±0.96 ^{bc}	0.002
Physical symptoms: breast tenderness, headaches, joint/muscle pain, bloating, weight gain	0.19±1.01 ^b	-0.19±1.13	-0.72±1 ^b	0.003

*By using one-way ANOVA test. ^aBy using Tukey's test, differences between bitter orange and control group is significant. ^bBy using Tukey's test, differences between Rose and control group is significant. ^cBy using Tukey's test, differences between Rose and bitter orange group is significant

Table 4: Comparison of mean differences of social symptoms between bitter orange, Rose, and control groups

Variable	Control	Bitter orange	Rose	P*
Symptoms interference with work efficiency or productivity	0.06±0.81	0.03±1.3	-0.42±1.09	0.136
Symptoms interference with relationships with coworkers and friends	0.35±0.66 ^{a,b}	-0.22±0.95 ^a	-0.45±0.75 ^b	<0.001
Symptoms interference with relationships with family	0.19±0.6 ^b	-0.16±0.96	-0.51±0.83 ^b	0.004
Symptoms interference with social life activities	0.22±0.8 ^b	-0.25±0.96	-0.36±0.85 ^b	0.028
Symptoms interference with home responsibilities	0.29±0.73 ^b	0.03±0.83	-0.3±0.95 ^b	0.024

*By using one-way ANOVA test. ^aBy using Tukey's test, differences between bitter orange and control group is significant. ^bBy using Tukey's test, differences between Rose and control group is significant. ^cBy using Tukey's test, differences between Rose and bitter orange group is significant

muscle and joint pain, bloating, and weight gain ($P = 0.002$) but the effect of Neroli was not significant on any of the physical variables [Table 3].

In terms of the effect of intervention on social activities, it is observed that the mean score of the two intervention groups decreased while it increased in the control group and this decrease was significant only in the Rosa Damascena group ($P < 0.001$) but there was no significant difference between the two intervention groups ($P = 0.081$). Aromatherapy with Neroli had a positive effect only on the relationship between the coworkers and friends ($P = 0.014$) but Rosa Damascena in addition to effect on this variable ($P < 0.001$), had a positive effect on family relationship ($P = 0.003$), social life activities ($P = 0.022$), and home responsibilities ($P = 0.017$) [Table 4].

In terms of side effects, headache associated with nausea and vomiting.

Discussion

Based on the present study, aromatherapy with both Rosa Damascena and Citrus Aurantium blossom essential oils had an effect on the overall score of psychological symptoms of premenstrual syndrome. Rosa Damascena, in contrast to Neroli, had a significant effect on anger and irritability and its effect has been more than that of Neroli. Contrary to the present study, a review showed inhalation or oral administration of Citrus Aurantium can be useful for anxiety reduction^[25] one study showed that Citrus Aurantium L. reduced anger in pregnant women^[26] is likely to reduce the anxiety in magnetic resonance imaging.^[27] Unlike other studies, in the present study, none of the essential oils had an effect on anxiety but Neroli had an effect on feelings of overwhelmed or out of control. The effect of the Citrus Aurantium blossom on preoperative anxiety^[11] and blended essential oil containing Neroli on anxiety in patients

of ICU^[28] and on stress reduction in hypertensive patients^[29] were observed in the studies. Even aromatherapy with Citrus Aurantium blossom distilled water was effective for anxiety of the active phase of labor.^[30] But in the Choi study, in line with this study, stress reduction of postmenopausal women by using 5 Neroli was not significant.^[14] Antianxiety effects of Rosa Damascena are also reported in the studies.^[8]

Both essential oils were effective for tearful and increased sensitivity to rejection but Rosa Damascena also had an effect on depression and hopelessness. In line with this study, the effect of this essential oil on depression and its antidepressant is confirmed.^[31] According to the Imura study, also massaging aromatherapy by essential oil containing Citrus Aurantium improved the mood of women after childbirth, In the present study, the sensitivity of the subjects and their feelings of overwhelmed have decreased but in the study of Imura, in contrast to the present study, aromatherapy had a significant effect on depression.^[32] However, animal studies also showed the effect of Citrus Aurantium essential oil on anxiety.^[13] Animal studies also confirmed the anti-anxiety effect of Citrus Aurantium by the regulation of 5-HT receptors^[33] and antidepressant effects through the monoaminergic system.^[34]

Of the two studied essential oils, only Rosa Damascena was effective for disturbance in concentration. In Lindsay study, aromatherapy with orange blossom essential oil with a similar composition of Neroli had no effect on concentration.^[35]

None of the two essential oils had an effect on insomnia but Rosa Demecensa had an effect on hypersomnia and it had a more significant effect than Neroli. Studies also pointed to the effect of Rosa Damascena on sleep.^[9] Also, contrary to the present study, a study in mice showed that Citrus Aurantium can increase the barbiturates-induced sleep time.^[13]

In comparison between two essential oils, Rosa Damascena decreased the overall score of psychological symptoms more than

that of Citrus Aurantium blossom though this difference was not significant. It has affected a greater number of psychological symptoms and its effect on some psychological symptoms has also been greater than that of Neroli. So, it can be said that Rosa Damascena had a greater impact on psychological symptoms.

According to studies, Rosa Damascena and Citrus Aurantium are essential oils that have always been used to improve depression and anxiety. Rose oil is sedative and healing the effects of which are contributed to 2-phenylethanol and citronellol,^[36] while its hypnotic, antidepressant, and anti-anxiety effects are attributed to flavonoids.^[9] The effects of Citrus Aurantium are also attributed to the limonene contained therein.^[37] Therefore, the effect of these two essential oils on psychological symptoms of PMS can be justified.

The overall score of physical symptoms decreased in all three groups but the most considerable and significant decrease was observed in Rosa Damascena group. Rosa Damascena had a significant effect on fatigue and lack of energy, pain, bloating, and weight gain. In the conducted studies, its effect was observed on pain, including postoperative pain in children,^[38] dysmenorrhea^[39] and after burn dressing pain.^[40] In traditional Persian medicine, Rosa Damascena was also used to treat abdominal and chest pain and digestive disorders.^[9] Aromatic oils reduce pain through aromatherapy by affecting the olfactory gland, limbic system, and arousal of affection.^[12] Neroli essential oil, unlike Rose essential oil, had no effect on any of the physical symptoms. Also, orange essential oil with a similar composition of Citrus Aurantium had no effect on physiological variables.^[41] Other studies also revealed results contrary to the present study. Namazi study proved the effect of distilled water of Citrus Aurantium blossom on labor pain.^[12] The effect of a compound essential oil containing Citrus Aurantium on reducing the burn pain is also shown.^[42]

Score of effect of aromatherapy on social activity of patients with premenstrual syndrome in both interventional groups decreased but this decrease was significant only in the Rose group. In addition, Rosa Damascena also had a positive impact on relationships, social activities and home responsibilities, whereas Citrus Aurantium blossom had only a significant effect on relationship with friends and colleagues. So, it can be concluded that the effect of Rosa Damascena on improving the social function of patients with PMS had been more than that of Citrus Aurantium blossom. In a study, the effect of petitgrain (an extract from small leaves and small branches of Citrus Aurantium tree) on improving the performance in the working environment, due to autonomic balance of sympathetic and parasympathetic system, is confirmed^[43] one of the suggested reasons for PMS is the reduction of parasympathetic activity.^[4] Both plants of Rosa Damascena and Citrus Aurantium have anticholinergic effects by inhibiting acetylcholinesterase receptors, and compounds such as flavonoids found in Rosa Damascena have the effect of inhibiting acetylcholinesterase receptors.^[37]

Therefore, according to the conducted studies, the use of aromatherapy by essential oils is recommended due to lack

of complications or limited complications, such as headache, nausea and vomiting, which were observed in the Rose group,^[29] Aromatherapy was a simple, low-risk, and cost-effective method which can be used by primary care physicians for management of sign and symptoms.^[44] In a study, physicians were the most frequent source of information about complementary medicine and medicinal plants^[45] so they can suggest aromatherapy for women who come to them due to PMS. On the contrary, given the high cost of health care services, and the lack of access to medical facilities by many countries, traditional and complementary use is an important tool for improving health and treatment at a very low cost. In this method of treatment, the body's natural power is used for treatment.^[46]

The selection of samples from medical students due to the probability of error in reporting symptoms or their knowledge of the premenstrual syndrome was one of the limitations of this study. Therefore, it seems necessary to conduct further studies in this regard on other groups of women and compare the effects of other plants on premenstrual syndrome with Rosa Damascena and Citrus Aurantium blossom in samples with higher number of individuals.

Conclusion

Therefore, Rosa Damascena and Neroli essential oils are both effective in improving the symptoms of premenstrual syndrome. However, Neroli had more effects on psychological symptoms of the syndrome while Rosa Damascena was effective for physical symptoms and improved social function in addition to psychological symptoms. Perhaps, from this perspective it can be concluded that Rosa Damascena have had a greater impact than Neroli.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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