

Antianxiety and antidepressant potential of Bach flower remedies in acute and chronic stress models of Wistar rats

Aarya Koshe, Priti Dhande*, Jayshree Dawane & Gourav Deshmane

Department of Pharmacology Bharati Vidyapeeth (Deemed to be University) Medical College, Pune 411 043

*E-mail: priti.dhande@bharativedyapeeth.edu

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Bach flower remedies (BFRs), a form of complementary therapy, are known for emotional healing properties. However, limited scientific data exists to substantiate their efficacy and mechanism of action in stress-related neurobehavioral conditions. This study evaluates antianxiety and antidepressant effects of BFRs using validated animal models. 48 Wistar rats (180–250 g) of either sex were randomly divided into eight groups (n=6). Acute stress was induced by forced swim test and diazepam (2 mg/kg) used as standard. Chronic stress induced via 1-h daily restraint for 30 days. BFRs (0.5 mL/kg) administered either prophylactically or therapeutically and fluoxetine (10 mg/kg) used as standard. Behavioural assessments included Tail Suspension and Light-Dark Transition Tests. Locomotor activity, body weight, and food intake was recorded. At the end of chronic study, brain dopamine and serotonin levels were estimated. In acute stress model, rats treated with BFRs showed significantly ($p<0.001$) reduced immobility time and increased exploratory behaviour. Prophylactic and therapeutic administration of BFRs in chronic stress model led to improved body weight, food intake and locomotor activity. Behavioural tests revealed decreased immobility ($p<0.01$) in the Tail Suspension Test and increased time spent ($p<0.001$) in light chamber during the Light-Dark Transition Test. Biochemical analysis showed elevated brain serotonin and dopamine levels in BFR-treated groups, comparable to standard fluoxetine group. Bach flower remedies demonstrated promising antianxiety and antidepressant activity in both acute and chronic stress models in Wistar rats. These findings support their potential role as adjunctive therapies in managing stress-related neurobehavioral disorders.

Keywords: Anxiety, Bach flower remedies, Depression, Dopamine, Serotonin, Stress

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Stress and anxiety are increasingly recognized as significant contributors to the global burden of mental illness. Prolonged exposure to stress can dysregulate the hypothalamic–pituitary–adrenal (HPA) axis and increase vulnerability to major depressive disorder (MDD)¹. Epidemiological studies indicate that chronic daily stress, when inadequately managed, is strongly associated with the onset and progression of anxiety and depressive disorders, underscoring the importance of effective interventions for maintaining mental health².

Depression alone has been identified as one of the leading causes of disability worldwide. It has been ranked as the third leading cause of disease burden in 2008 by World Health Organization (WHO), and projected to become the foremost cause by 2030³. Beyond personal suffering, depression and anxiety disorders impose substantial socioeconomic costs, including reduced productivity, increased healthcare utilization, and long-term disability⁴.

Although pharmacological therapies such as selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants (TCAs), and benzodiazepines remain the cornerstone of treatment, they are associated with significant drawbacks. Adverse effects including weight gain, sexual dysfunction, cognitive impairment, dependence, and drug–drug interactions frequently limit adherence and long-term use^{5,6}. This has prompted increasing interest in complementary and alternative medicine (CAM) approaches that may provide effective symptom management with fewer side effects.

Bach flower remedies (BFRs), first developed by Dr. Edward Bach in the 1930s, constitute a system of 38 flower essences prepared from wildflowers. They are intended to address a range of emotional states by restoring inner balance and resilience⁷. Although widely used in Europe and other parts of the world, scientific validation of their efficacy remains limited, with most available evidence being anecdotal or based on uncontrolled studies⁸. Nonetheless, the growing

*Corresponding author

use of BFRs reflects a demand for safer, holistic interventions in mental health care.

Given these gaps, preclinical evaluation of BFRs in validated animal models of anxiety and depression can provide valuable insights into their potential mechanisms and therapeutic utility. This exploratory study attempts to bridge the gap between anecdotal or clinically observed human efficacy of BFRs and objective biological correlates by employing controlled preclinical stress models and biochemical endpoints.

Materials and Methods

The study was approved by the Institutional Animal Ethics Committee (BVDUMC/2213/2024/02/16) and was conducted in accordance with CCSEA guidelines. The study was conducted on 48 wistar rats of either sex who weighed around 180–250 g. Animals were housed in polypropylene cages under controlled environmental conditions (temperature $23\pm 2^\circ\text{C}$, 50–60% humidity, 12:12 h light–dark cycle) with free access to standard pellet diet and filtered water ad libitum. All behavioural studies were carried out during the light phase (09:00–16:30 h).

Study drug: The Bach flower remedy used was a mixture of Mimulus, Rock rose, Cherry plum, Sweet chestnut, White chestnut, Gentian, and Rescue remedy, as recommended by a certified practitioner. Mimulus is used to overcome the reasonable fear, White Chestnut is used to control the thoughts which worry while Sweet Chestnut is used for those who have dependency and despair. Gentian is for those who are discouraged, Rock Rose is used when the patient is terrified and Rescue Remedy is to restore balance and calmness in the situation of crisis or emergency. As all these are the emotions in anxiety and depression state, these specific flowers were considered and the dose is designed accordingly.

Two methods are used to prepare these flower remedies- Gentian, Mimulus, Rock Rose used here were prepared by Sunshine method (The blooms of the plants are picked and immediately floated on the surface of pure water taken in a thin glass bowl so as to cover it and then left in the bright sunshine for 3 or 4 h or less time if the blossom begin to show signs of fading. The blossom are then carefully lifted out and the water poured into bottle so as to half fill them, these are then filled up with vinegar or brandy to preserve the remedy as stock). Cherry plum, Sweet chestnut, white chestnut were prepared by the boiling method (The specimens as about to be described

where boiled for half an hour in a clean pure water, the fluid strained off, poured into bottle until half-filled and then cold brandy or vinegar is added to the bottle to preserve the stock).

Body weight and food intake of the study animals were recorded regularly.

Animals were randomly allocated into eight groups (n=6 per group):

Acute Stress Model (Forced Swim Test, FST)

- Group 1: Control (no stress, no treatment)
- Group 2: Acute stress + Bach flower remedy (0.5 mL/kg, p.o.)
- Group 3: Acute stress + Diazepam (2 mg/kg)

Acute stress was induced by placing the animals individually in a vertical Plexiglas cylinder (40 cm height \times 18 cm diameter) with 15 cm of water maintained at $25\pm 1^\circ\text{C}$. Each rat was forced to swim for 3 min, and the duration of immobility was recorded as a measure of behavioural despair. Water was changed after each trial. Measurements were taken at baseline and 1 h after drug administration on the same day.

Chronic Mild Stress Model

- Group 4: Control (no stress, no treatment)
- Group 5: Chronic stress + vehicle
- Group 6: Chronic stress + Bach flower remedy prophylactic (0.5 mL/kg, p.o., day 1–30)
- Group 7: Chronic stress + Bach flower remedy therapeutic (0.5 mL/kg, p.o., day 15–30)
- Group 8: Chronic stress + Fluoxetine (10 mg/kg, p.o., day 15–30)

From day 1 to day 30, rats were subjected daily to 1 h of restraint stress in ventilated restrainers and overnight exposure to strong illumination. Control rats remained undisturbed in their cages. General behaviour like food and water intake and mobility was observed throughout the experiment while behavioural assessments were carried out and recorded on day 0 and day 30 using:

1) Tail Suspension Test (TST): Rats were suspended by the tail approximately 10 cm above the ground for 5 min, and the duration of immobility was recorded. Each animal was tested only once on the experimentation day, out of sight from other animals.

2) Light–Dark Transition Test (LDT): The apparatus consisted of a box (21 \times 42 \times 25 cm) with two equal compartments, one brightly lit and the other dark. Rats were placed in the dark compartment, and after 3 seconds the door was opened to allow free exploration for 5 min. Parameters recorded included

time spent in light and dark compartments, number of transitions, distance travelled, and latency to first entry into the light compartment. Chambers were cleaned with super hypochlorous water between trials to eliminate olfactory cues.

Biochemical parameters

On day 31, rats from chronic stress groups (Groups 4–8) were sacrificed by decapitation, skull was dissected and brain collected to prepare a homogenate for serotonin (5-HT) and dopamine level analysis.

Statistical analysis

Data was analysed using Graph pad Prism version 6. Paired 't' test was used to compare the behavioural parameters before (Day 0) and after treatment (Day 31); while ANOVA followed by Dunnett's test was applied to compare the neurochemical parameters among the different groups with those of the control group and disease control group. $p < 0.05$ was considered statistically significant.

Results

This study has explored the antianxiety effect of Bach flower remedies in the acute stress model while the antidepressant effect was assessed in the chronic mild stress model using wistar rats.

Figure 1 shows that the BFR-treated rats showed significantly ($p < 0.001$) reduced immobility and enhanced exploratory behaviour in the acute stress model of forced swim test. The reduced phase of immobility with BFR was comparable to that obtained with the standard treatment diazepam.

Figure 2 depicts that there was significant reduction ($p < 0.001$) in immobility time in the chronic stress model – tail suspension test, after prophylactic as well as therapeutic treatment with Bach flower

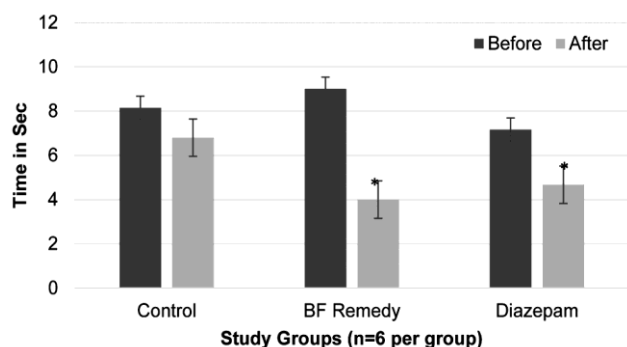


Fig. 1 — Effect of Bach Flower Remedies on Immobility Time in Forced Swim Test (acute stress model)

* $p < 0.001$ using paired 't' test to compare the immobility time before and after treatment (1 h after drug administration)

remedies which was comparable to that with standard drug Fluoxetine.

In the Figure 3, it can be seen that there was significant increase ($p < 0.01$) in the time spent in light chamber of the Light and dark box, after the therapeutic treatment with Bach flower remedies which was comparable to that with standard drug Fluoxetine.

Improved body weight, food intake, locomotor activity & behavioural scores were similar to fluoxetine group.

It can be observed that brain dopamine levels have significantly ($p < 0.05$) reduced in the disease control group after exposure to chronic mild stress for 30 days Figure 4. In the drug treated groups, dopamine levels are seen to be increased which is statistically significant ($p < 0.05$) in the BFR prophylactically treated group when compared with disease control group. The rise in brain dopamine levels in the therapeutic BFR and fluoxetine group, when

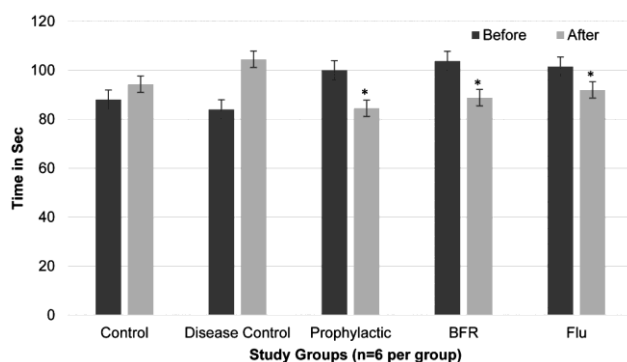


Fig. 2 — Effect of Bach Flower Remedies (BFR) on Immobility Time using Tail Suspension test

BFR- Therapeutic Bach Flower Remedy, Flu- Fluoxetine

* $p < 0.001$ using paired 't' test to compare the immobility time before (Day 0) and after (Day 31) treatment

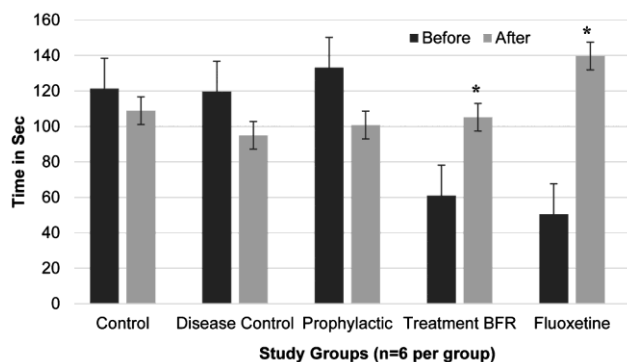


Fig. 3 — Effect of Bach Flower Remedies (BFR) on Time Spent in Light Chamber of Light & dark box

BFR- Bach Flower Remedy * $p < 0.01$ using paired 't' test to compare the time spent in light chamber before (Day 0) and after (Day 31) treatment

compared with the disease control group, was not statistically significant.

Figure 5 shows that brain serotonin levels have significantly ($p < 0.05$) reduced in the disease control group after chronic stress given for 30 days. In the drug treated groups, serotonin levels are seen to be increased which are not statistically significant but the levels in both the BFR prophylactically as well as therapeutically treated groups were comparable to those of the standard group given Fluoxetine.

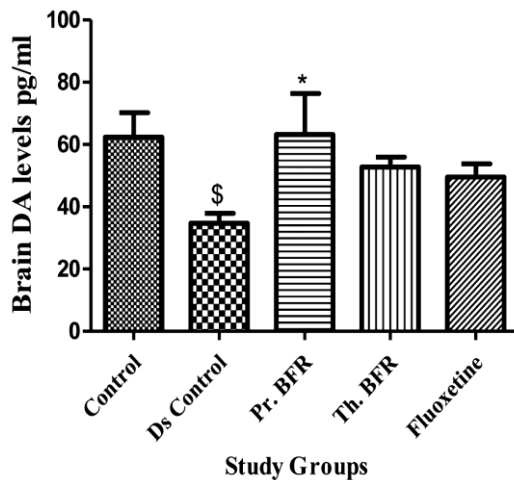


Fig. 4 — Effect of Bach Flower Remedies (BFR) on dopamine levels in brain tissue on day 31

Ds = Disease; Pr. = Prophylactic; Th. = Therapeutic

\$ $p < 0.05$ using ANOVA followed by Dunnett's test in comparison with control group, * $p < 0.05$ using ANOVA followed by Dunnett's test in comparison with disease control group

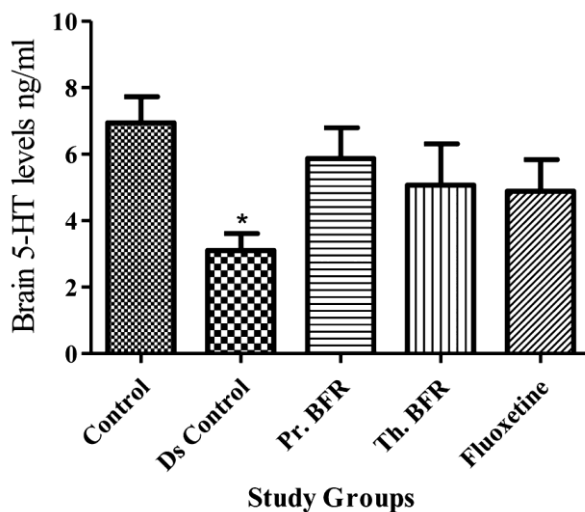


Fig. 5 — Effect of Bach Flower Remedies (BFR) on Serotonin levels in brain tissue on day 31

Ds = Disease; Pr. = Prophylactic; Th. = Therapeutic, * $p < 0.05$ using ANOVA followed by Dunnett's test in comparison with control group

Discussion

The WHO Traditional Medicine Strategy developed in 2013 for the duration of 2014–2023 has prioritized the use of complementary medicine in health care⁹. Flower therapy is one of the component of alternative or complementary medicine where the flower essences are made from wild natural sources and are seen to be compatible with other forms of treatment available. Dr. Edward Bach worked extensively on such flower remedies and his discovery of 38 remedies have shown to act by harmonizing the feelings and assist the body to heal by itself¹⁰.

Studies have indicated that stress response involves an interplay of several neurotransmitter systems, including serotonin, norepinephrine, GABA, glutamate, opioids, dopamine, and endocannabinoids¹¹. Bach flower remedies (BFRs), have been traditionally used to relieve emotional stress manifesting as nervousness, fear, panic, hopelessness, despair, lack of confidence, feeling of guilt, apathy, etc^{12,13}. On literature search we could find a lot of research work evaluating BFRs in psychopharmacological animal models¹⁴ or for clinical use in stressful conditions and psychological problems¹⁰; and even systematic review articles¹⁵, where most of the researchers have attributed the beneficial effect of BFRs in stressful situation to the better balance of feelings and emotional well-being achieved after treatment with BFRs. It is mentioned that there are no pharmacologically effective remnants in the BFRs, due to which the benefit of this remedy is through the life force energy or vibration that is transmitted from the flowers to the remedy^{12,13}.

The current study was undertaken to evaluate anxiolytic and antidepressant effects of BFRs on acute and chronic stress models of wistar rats and understand the effect of BFR on brain levels of dopamine and serotonin neurotransmitters, if any. In the acute stress model, BFR-treated rats showed reduced immobility and enhanced exploratory behaviour which was comparable to the results produced by standard drug diazepam (Fig. 1). This effect suggests that there could be modulation of GABAergic system which is the proven mechanism of action with diazepam.

In the chronic mild stress model, when the effect of prophylactic as well as therapeutic administration of BFR was explored, this remedy showed significant reduction (Fig. 2) in immobility time during the tail suspension test, which was comparable to that with standard drug Fluoxetine. Similarly the results in the Light and Dark box test were comparable to that of

Fluoxetine where a significant increase (Fig. 3) in time spent in light chamber was observed in the rats who were treated with BFR from day 15 to 30 (therapeutic group). Alternative explanations, including contextual effects, stress associated with oral administration, and habituation due to repeated handling, may have contributed to some extent for the observed behavioral changes. This chronic mild stress model is a well-established model for evaluation of antidepressant activity of new molecules where all the drug treated animals are exposed equally to the above procedural stress¹⁶. The study methodology was strong enough to mitigate the effect of the above confounding factors- trained and same person involved in daily feeding activity as well as maintenance of the experimental animals, observations recorded in a sound proof, dark room by the expert investigator and all the tests done meticulously. Fluoxetine is a selective serotonin reuptake inhibitor which increases the concentration of serotonin in the brain. As BFR has shown responses comparable to Fluoxetine in the experimental evaluation models of chronic stress, effect on the serotonergic system might be possible with BFRs.

The relationship between serotonin, dopamine and depression is complex and this has been explored in various studies. The central serotonergic system has been shown to modulate the dopamine levels in situations of aggression, depression as well as other mood changes. Low levels of serotonin and relatedly also lower dopamine levels have been found in patients of depression in the cerebrospinal fluid^{17,18}. In the current study, brain dopamine and serotonin levels were significantly reduced due to chronic stress in the disease control group when compared to control group. These neurotransmitter levels in the drug treated groups (prophylactic, therapeutic BFR and fluoxetine groups) were comparable to the control group (Fig. 4 & Fig. 5) as no statistically significant difference was found between the levels in these groups. This shows that BFR and Fluoxetine treatment partially normalized the stress-induced neurochemical alterations, in these study animals. Researchers have shown significant reduction of acute anxiety as well as greater pain relief and reduction of negative emotions with BFR than that with placebo^{12,19}. A great possibility of BFR affecting brain neurotransmitter levels can't be ruled out.

Emphasizing the integration of behavioural and neurochemical assessments has distinguished this

work from prior human studies. Neurotransmitter measurements are associative rather than mechanistic, hence further studies to generate more evidence for the effect of BFR on brain neurotransmitter levels are necessary. Also dose-response assessment as well as molecular target validation has not been performed in this study which may be a scope for future research.

Conclusion

Bach flower remedies is a naturally obtained, safe, and effective medicine which has shown comparable efficacy with standard drugs for both acute and chronic stress. The results of this study encourages use of add-on complementary therapies for non-responders to conventional treatments.

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Author Contributions

AK Conceptualization; Formal analysis; Resources; Writing - original draft, PD Conceptualization; Funding acquisition; Resources; Supervision; Writing - review & editing. JD Conceptualization; Formal analysis; Supervision; Writing - review & editing. GD Formal analysis; Software; Supervision; Writing - review & editing.

Conflict of Interest

Authors declare that there are no conflicts of interest.

Ethics Approval

This study was approved by the Institutional Animal Ethics Committee (BVDUMC/2213/2024/02/16).

Informed Consent

As the study does not involve human participants, informed consent does not apply.

Use of Artificial Intelligence

Artificial intelligence was not used while writing the manuscript.

Data Availability

Authors will provide raw data supporting the study's conclusions upon appropriate request.

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