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Exploring the Antidepressant Properties of *Musa paradisiaca Linn* and *Matricaria recutita*: A Comprehensive Systematic Review

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ABSTRACT: Depression, a prevalent mental health disorder, presents significant challenges in management due to the limitations and adverse effects associated with conventional antidepressant medications. In recent years, there has been a growing interest in exploring natural alternatives for depression treatment. *Musa paradisiaca Linn and Matricaria recutita* have emerged as promising botanicals with potential antidepressant properties. This systematic review aims to provide a comprehensive analysis of the available evidence regarding the antidepressant effects of *Musa paradisiaca Linn* and *Matricaria recutita*, along with their safety profiles and mechanisms of action. A systematic search of electronic databases was conducted to identify relevant studies, including preclinical and clinical trials. Eligible studies were assessed for methodological quality, and data synthesis was performed to evaluate the efficacy and safety of the botanical interventions. The findings of this review highlight the potential of *Musa paradisiaca Linn* and *Matricaria recutita* as alternative or adjunctive treatments for depression. Mechanistic insights suggest involvement in neurotransmitter modulation, anti-inflammatory effects, and antioxidant activity. However, further well-designed clinical trials are needed to confirm these effects and establish optimal dosing regimens. Overall, this review underscores the importance of considering natural remedies in the management of depression and provides valuable insights for clinicians and researchers.

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INTRODUCTION:

Depression is a leading cause of disability worldwide, affecting individuals of all ages and backgrounds. Despite the availability of pharmacological treatments, many patients experience only partial symptom relief or encounter adverse effects, prompting the search for alternative therapies. *Musa paradisiaca Linn* (banana) (Fig 1) and *Matricaria recutita* (chamomile) (Fig 2) and have gained attention for their potential antidepressant effects, drawing interest from both traditional medicine and scientific research. This section provides an

overview of depression, current treatment options, and the rationale for exploring botanical interventions for depression.

This review article provides a comprehensive overview of the antidepressant effects of *Musa paradisiaca Linn* and *Matricaria recutita*, synthesising available evidence from preclinical and clinical studies. It offers valuable insights for clinicians, researchers, and individuals seeking alternative treatments for depression.

Fig 1. *Musa paradisiaca* Linn.

Fig 2. *Matricaria recutita.*

DEPRESSION:

Depression is a mood disorder that causes of sadness, emptiness, persistent feelings and loss of joy. It differs from the normal mood fluctuations people experience as part of life. Major life events, such as bereavement or job loss, can trigger depression[1]. Depression, also known as major depressive disorder or clinical depression, affects how you feel, think, and behave. It can lead to a variety of emotional and physical problems. Depression is characterized by persistent feelings of sadness, loss of interest or pleasure, and lack of motivation. People with depression often experience changes in sleep patterns, appetite, and energy levels. Difficulty concentrating, feelings of guilt, and thoughts of self-harm are also common.

Etiology of depression:

The etiology of depression is multifaceted and involves a combination of various factors. Let's explore these in more detail:

Biological Factors:

- Genetic Vulnerability: Heredity plays a significant role. About half of the etiology of depression is attributed to genetic factors, although this is less pronounced in late-onset depression [2].
- Neurotransmitters: Imbalances in brain chemicals like serotonin, norepinephrine, and dopamine contribute to depressive symptoms.
- Neuroendocrinological Mechanisms: Hormonal disruptions may affect mood regulation.

Environmental Stressors:

- Acute Life Events: Stressful experiences, such as loss, trauma, or major life changes, can trigger depression.
- Chronic Stress: Prolonged exposure to stressors affects vulnerability.
- Childhood Adversity: Early exposure to adversity increases the risk.

Personal Vulnerabilities:

- Cognitive Factors: Negative thought patterns, self-criticism, and pessimism.
- Interpersonal Factors: Difficulties in relationships and social isolation.
- Personality Traits: Certain personality characteristics may predispose individuals to depression.

Co-Occurring Disorders:

- Depression often coexists with other psychological disorders, such as anxiety, substance abuse, and personality disorders.
- The presence of co-occurring conditions complicates treatment.

Resilience and Protective Factors: Some factors protect against depression or help overcome risk:

- Social Support: Strong social connections.
- Coping Skills: Effective strategies for managing stress.
- Positive Life Events: Experiences that counterbalance adversity.
- Depression arises from a complex interplay of biological, environmental, and personal factors.

Approaches to the development of antidepressants targeting (Fig 3). Understanding these factors is crucial for effective prevention and treatment [3].

Fig 3. Approaches to the development of antidepressants targeting.

Symptoms:

Depression, also known as major depressive disorder, is a serious mental health condition characterized by persistent feelings of sadness, loss of interest or pleasure, irritability, changes in energy levels, sleep disturbances, and negative self-perception (Fig 4). The symptoms of depression can vary from person to person, but they commonly include:

- Feeling Sad or Empty:
  - Prolonged periods of sadness or low mood.
  - A sense of emptiness or inability to experience happiness.
- Hopelessness and Helplessness:
  - Feeling that there's no end to the emotional pain.
  - Believing that no one can help improve the situation.
- Worthlessness:
  - Feeling as though life has no meaning.
  - Believing that one is a burden to others.
- Excessive Guilt:
  - Ongoing feelings of guilt, even for minor things.
  - Focusing energy on self-blame.
- Loss of Pleasure:
  - Diminished interest in activities once enjoyed.
  - Inability to experience pleasure.
- Irritability:
  - Easily becoming annoyed or agitated.
- Fatigue:
  - Persistent tiredness and lack of energy.
- Appetite Changes:
  - Either increased or decreased appetite.
- Thoughts of Death or Suicide:
  - Persistent thoughts about death or self-harm.

Fig 4. Signs and symptoms of depression.

Pathophysiology of depression:

Depression is a serious disorder that affects millions of people worldwide. Let's delve into its pathophysiology and mechanisms of treatment:

Biochemical Hypothesis:

In the 1950s, the discovery of antidepressant drugs led to the first biochemical hypothesis of depression. This hypothesis suggested that an impairment in central monoaminergic function (specifically involving neurotransmitters like serotonin (5-HT) and norepinephrine (NE)) was the major underlying cause of depression. The monoaminergic system plays a crucial role (Fig 5 and 6) but other brain systems and central nervous system regulation are also involved.

***Clinical Presentation: Depression manifests as a triad of symptoms*:**

- Low or depressed mood
- Anhedonia (loss of interest or pleasure)
- Low energy or fatigue
- Other symptoms include sleep disturbances, feelings of guilt, low self-esteem, suicidal tendencies, and autonomic and gastrointestinal disturbances.

***Complex Phenomenon*:**

Depression is not a homogeneous disorder; it has many subtypes and likely more than one ethology. It includes Predisposition to episodic mood disturbances, Differences in symptom severity, and Interactions with other psychiatric and somatic disorders.

Classification and Diagnosis:

Major depressive disorder is characterized by one or more major depressive episodes without a history of manic or hypomanic episodes. `DSM-IV criteria include specific symptoms such as depressed mood, loss of

interest, appetite alterations, insomnia or hyposomnia, psychomotor disturbances, fatigue, feelings of worthlessness, and suicidal ideation.

Multiple Factors Involved:

Depression doesn't solely result from an imbalance of brain chemicals.

Possible causes include:

- Faulty mood regulation by the brain
- Genetic vulnerability
- Stressful life events
- These forces interact to contribute to depression.

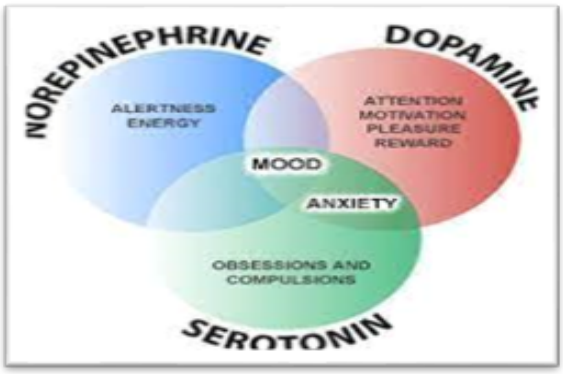

Fig 5. Major Depressive Disorder.

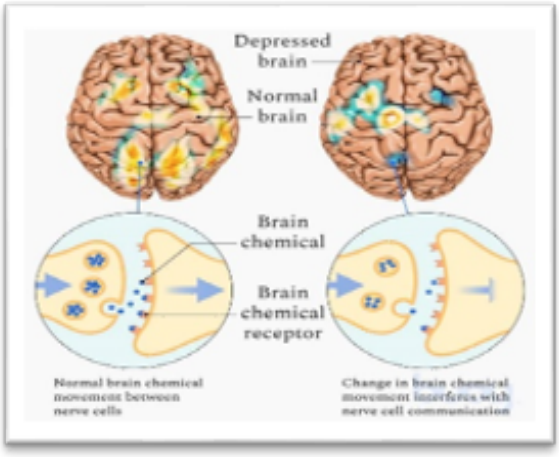

Fig 6. Pathophysiology study, Major depression case.

Causes of depression:

Depression does not have a single cause. There are many factors that play a role in increasing the risk that a person will develop the condition. Women experience depression at higher rates than men (10.5 % of women v/s. 6.2 % of men) [4]. which experts suggest may be due to hormonal factors. Depression is a complex condition and its causes are not fully understood. However, it's generally believed to be a combination of several factors (Fig 7).

- Biological Factors: An imbalance of neurotransmitters in the brain, including serotonin and dopamine, can contribute to depression.
- Genetic Vulnerability: Depression can run in families, suggesting a genetic link [5].
- Stressful Life Events: Significant life changes or stressful events can trigger depression in some people [6].
- Medical Conditions: Certain medical conditions such as hypothyroidism, heart disease, Parkinson's disease, and cancer can cause depression.
- Substance Use: The use of certain drugs or alcohol can increase the risk of depression.
- Poor Nutrition: Lack of certain nutrients can contribute to depression.

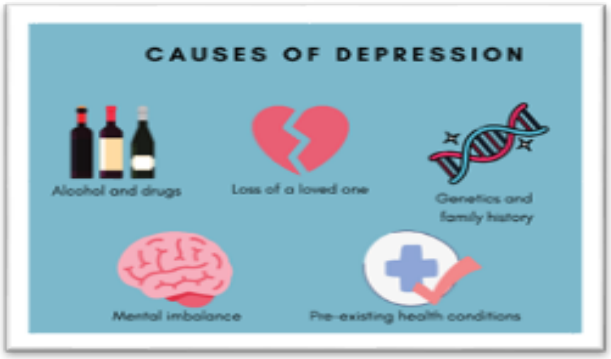

Fig 7. Causes of depression.

It's important to note that these factors can interact in complex ways. For example, a person might have a genetic predisposition that's triggered by a stressful life event. Each person's experience with depression is unique, and what causes depression in one person might not cause it in another.

Types of depression:

Depression can manifest in several different forms, each with its own set of symptoms and characteristics. Here are some of the most common types [7].

- Major Depressive Disorder (Clinical Depression): Characterized by a persistent feeling of sadness or a lack of interest in outside stimuli.
- Persistent Depressive Disorder (Dysthymia): A type of chronic depression present for more days than not for at least two years.
- Bipolar Disorder (Manic Depression): This type involves periods of severe mood episodes from mania to depression.
- Postpartum Depression (Peripartum Depression): A complex mix of physical, emotional, and behavioral changes that happen in some women after giving birth.

- Seasonal Affective Disorder (SAD): Depression that's related to changes in seasons.
- Psychotic Depression (Depression with Psychosis): This condition occurs when a person has severe depression plus some form of psychosis.
- Premenstrual Dysphoric Disorder (PMDD): A severe, sometimes disabling extension of premenstrual syndrome (PMS) that can cause extreme mood shifts.
- Atypical Depression (Depression with Mood Reactivity): Depression that temporarily lifts in response to positive events.
- Disruptive Mood Dysregulation Disorder (DMDD): A childhood condition of extreme irritability, anger, and frequent, intense temper outbursts.
- Situational Depression (Reactive Depression): A short-term, stress-related type of depression.

ANTIDEPRESSANTS:

Antidepressants are a class of medications primarily used in the treatment of mood disorders such as major depressive disorder and anxiety disorders. They can also be used to treat a number of other conditions, including obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), and chronic pain. The development and history of antidepressants began in the 1950s, with the clinical use of two antidepressant drugs: iproniazid (a monoamine-oxidase inhibitor, or MAOI) and imipramine (a tricyclic antidepressant, or TCA). The introduction of selective serotonin reuptake inhibitors (SSRIs) in the late 1980s revolutionized the treatment of depression and other psychiatric disorders. Given the wide range of classes of antidepressants, each of them has their own specific mechanism of action. The key mechanism of action of most modern antidepressants is some modulation of serotonin reuptake, while others have more dopaminergic/noradrenergic effects. Despite many decades of research, there is no single proven theory that supports the monoamine hypothesis. The monoamine hypothesis is too reductionistic and simplistic to explain a complex phenomenon such as depression. Common side effects of antidepressants include dry mouth, weight gain, dizziness, headaches, akathisia, sexual dysfunction, and emotional blunting. There is an increased risk of suicidal thinking and behaviour when taken by children, adolescents, and young adults. It's important to note that the use of antidepressants should be under the supervision of a healthcare professional. They can provide a proper diagnosis and treatment options.

CLASSIFICATION OF ANTIDEPRESSANTS:

Antidepressants are classified into different types based on their structure and the way they work. Here are the major classes of antidepressants:

Selective Serotonin Reuptake Inhibitors (SSRIs):

Selective Serotonin Reuptake Inhibitors (SSRIs) are a class of drugs that are primarily used as antidepressants in the treatment of major depressive disorder and other psychological conditionsThese work by increasing the level of serotonin in the brain (Fig 8). SSRIs work by increasing serotonin levels in the brain, which improves communication between neurons. They increase levels of serotonin in the brain by preventing the reuptake of serotonin by nerves. SSRIs are often used as first-line pharmacotherapy for depression and numerous other psychiatric disorders due to their safety, efficacy, and tolerability. They are approved for use in both adult and pediatric patients. In addition to depression, SSRIs may also be used to treat a range of other conditions, for example: Anxiety, Bulimia nervosa, Fibromyalgia, Hot flashes, Obsessive-compulsive disorder, Panic disorder, Post-Traumatic Stress Disorder, and Premenstrual dysphoric disorder.

Side Effects: Like all medications, SSRIs can have side effects. However, they are generally well-tolerated and have fewer side effects compared to some other antidepressants.

Examples: Some common SSRIs include citalopram (Celexa), escitalopram (Lexapro), fluoxetine (Prozac, Sarafem), fluvoxamine (Luvox), paroxetine (Brisdelle, Paxil, Pexeva), sertraline (Zoloft), and vilazodone (Viibryd).

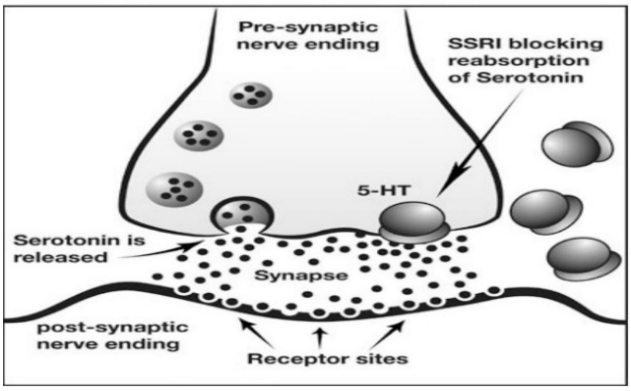

Fig 8. Mechanism of action of SSRI's.

***Mechanism of action*:**

The SSRIs block the reabsorption (reuptake) of serotonin into neurons. This makes more serotonin available to improve transmission of messages between neurons. SSRIs are called selective because they mainly affect serotonin, not other neuro transmitters.

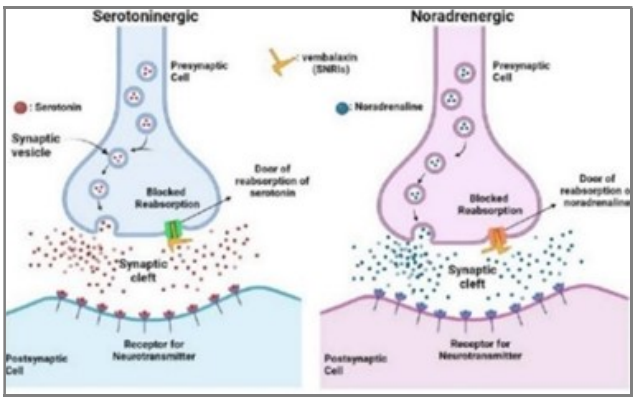

Fig 9. Mechanism of action of SNRI's.

Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs):

Serotonin and Norepinephrine Reuptake Inhibitors (SNRIs) are a class of medications that are primarily used to treat major depressive disorder (MDD) and other psychological conditions (Fig 9). These increase the levels of serotonin and norepinephrine in the brain.

Mechanism of action:

SNRIs work by increasing the levels of serotonin and norepinephrine in the brain by blocking or delaying their reuptake by nerves This means that more of these neurotransmitters are available in the brain, which can help to improve mood and alleviate symptoms of depression. SNRIs are used to treat a variety of conditions, including depression, anxiety disorders, chronic pain (especially nerve pain), fibromyalgia syndrome (FMS), and menopausal symptoms. They may also be helpful if you have chronic pain in addition to depression

Examples: Some common SNRIs include venlafaxine (Effexor), desvenlafaxine (Pristiq), duloxetine (Cymbalta), and levomilnacipran (Fetzima).

Side Effects: Like all medications, SNRIs can have side effects. However, they are generally well-tolerated and have fewer side effects compared to some other antidepressants.

Tricyclic Antidepressants (TCAs):

TCAs function by inhibiting the reuptake of neurotransmitters, such as serotonin and norepinephrine, which can modulate mood, attention, and pain in individuals. TCAs were initially introduced to the market in 1959 as a pharmacotherapy for major depressive disorder (MDD). They are now regarded as second-line treatment options alongside selective serotonin reuptake inhibitors (SSRIs).

Examples: The first TCA, imipramine, was initially created as an antipsychotic but was later discovered to have potent antidepressant properties. Imipramine's success prompted additional research, leading to the formulation of subsequent TCAs such as amitriptyline, nortriptyline, desipramine, and doxepin.

Side Effects: Although TCAs demonstrate equivocal efficacy with SSRIs when treating MDD, these medications cause more significant adverse effects due to their anticholinergic activity and lower threshold for over doses.

***Mechanism of action*:**

The TCAs are inhibiting serotonin and norepinephrine reuptake within the presynaptic terminals,resulting in elevated concentrations of these neurotransmitters within the synaptic cleft. The increased levels of norepinephrine and serotonin in the synapse can contribute to the antidepressant effect (Fig 10).

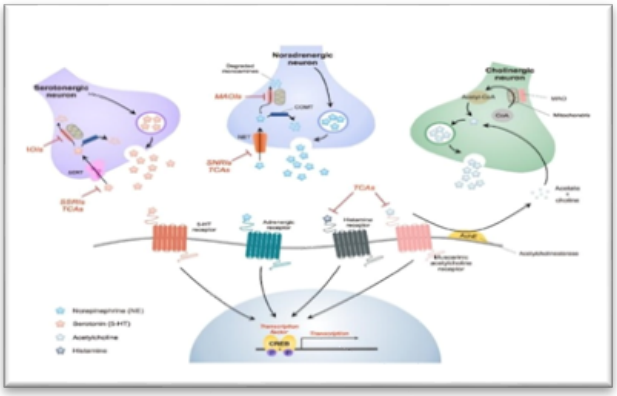

Fig 10. Mechanism of action of TCA's.

Monoamine Oxidase Inhibitors:

Monoamine Oxidase Inhibitors (MAOIs) are a class of drugs that inhibit the activity of one or both monoamine oxidase enzymes: monoamine oxidase A (MAO-A) and monoamine oxidase B (MAO-B). They are best known as effective antidepressants, especially for treatment-resistant depression and atypical depression. MAOIs block the actions of monoamine oxidase enzymes, which are responsible for breaking down neurotransmitters such as dopamine, norepinephrine, and serotonin in the brain. By blocking these enzymes, MAOIs increase the

concentration of these three neurotransmitters, thereby affecting changes in the brain chemistry that are operational in depression (Fig 11). MAOIs were the first type of antidepressant developed and are used to treat symptoms of depression that have not responded to other antidepressants. They should not be used to treat depression associated with bipolar disorder because they may precipitate manic symptoms.

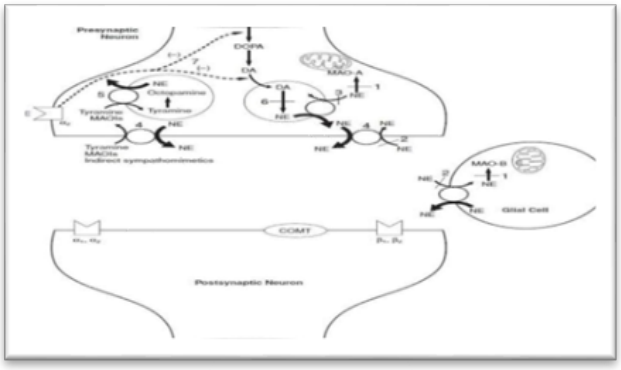

Fig 11. Mechanism of action of MAOI's.

Examples: The Food and Drug Administration (FDA) has approved these MAOIs to treat depression: Isocarboxazid (Marplan), Phenelzine (Nardil), Selegiline (Emsam), and Tranylcypromine (Parnate).

Side Effects: MAOIs can cause side effects such as dry mouth, nausea, diarrhoea or constipation, headache, drowsiness, insomnia, dizziness or light headedness. Because of side effects and safety concerns, MAOIs are most often tried when other antidepressants do not work.

Norepinephrine and Dopamine Reuptake Inhibitors (NDRIs):

These increase the levels of norepinephrine and dopamine in the brain. Norepinephrine and Dopamine Reuptake Inhibitors (NDRIs) are a class of drugs used primarily for the treatment of depression. They are also used to treat attention-deficit hyperactivity disorder (ADHD), narcolepsy, and Parkinson's disease. NDRIs work by inhibiting the reuptake of norepinephrine and dopamine in the brain. Norepinephrine is responsible for regulating alertness and concentration, while dopamine regulates mood. When these chemical messengers malfunction; it can contribute to mood disorders such as depression and anxiety. NDRIs are typically prescribed when other forms of antidepressants do not produce effective results or cause bothersome side effects. They are used to treat the following conditions: Depression, ADHD, Narcolepsy, Parkinson's disease, and Drug and alcohol cessation. Examples: Bupropion (Wellbutrin) is currently the only NDRI used to treat depression in the United States.

Side Effects: NDRIs can raise your blood pressure. You can develop a dependence on these drugs, leading to withdrawal symptoms upon stopping the medications. NDRIs can interact with other drugs, including MAOIs and antipsychotic medicines.

ANTIDEPRESSANT THERAPY (CURRENT TREATMENT OPTIONS):

Antidepressant therapy is a common treatment for depression, which involves the use of prescription medication, often in combination with psychotherapy [8]. Here are some key points:

Psychotherapy:

Also known as talk therapy, it helps relieve symptoms and prevent them from returning. It helps a person identify the thought patterns, learned behaviours, or personal circumstances that may be contributing to their depression [9].

Cognitive Therapy:

This is a type of cognitive behavioural therapy shown to be effective in helping people challenge and change unhelpful or unwanted beliefs or attitudes that result from traumatic experiences [9].

Behavioural Therapy:

This focuses on how certain behaviours influence or trigger symptoms of depression. It works by helping a person identify and understand specific behavioural triggers and then providing behavioural activation exercises that encourage behavioural modifications or changes where possible, resulting in more positive mood outcomes.

Cognitive Behavioural Therapy (CBT):

CBT is considered the best-researched technique and the "gold standard" of psychotherapy. It's been shown effective in reducing depression symptoms and helping patients build skills to change thought patterns and behaviours to break them out of depression**.**

Antidepressants:

These are usually taken daily. The goal in the first few weeks and months is to relieve the symptoms and, where possible, make the depression go away. Once that has been achieved, the treatment is continued for at least four to nine months. This continuation therapy is necessary to stop the symptoms from coming back [10].

The rationale for exploring botanical interventions:

The exploration of botanical interventions for depression is driven by several factors. The increasing prevalence of mental disorders worldwide, particularly depression, has necessitated the search for alternative treatments [11]. Conventional pharmacological therapies can have serious adverse effects, leading many patients to prefer herbal products for symptom relief. Certain herbs, such as banana, chamomile tea, lavender, passionflower, and saffron, have shown benefits comparable to standard anxiolytics and antidepressants. Moreover, many patients prefer natural treatments, viewing botanical interventions as a more holistic approach to healthcare. Botanical interventions can also be more cost-effective than conventional treatments [12]. The rationale for exploring botanical interventions for depression is based on several factors:

Increasing Prevalence of Mental Disorders:

The number of people suffering from depression and other mental disorders is increasing worldwide. This has led to a search for alternative treatments.

Adverse Effects of Pharmacological Therapy:

Conventional pharmacological therapy can have serious adverse effects, which is why many patients prefer to use herbal products to treat these symptoms.

Effectiveness of Herbal Medicine:

Some herbs have shown benefits comparable to standard anxiolytics and antidepressants. For example, lavender, passionflower, and saffron have shown promising results in clinical trials.

Patient Preference:

Many patients prefer natural treatments, and botanical interventions can provide a more holistic approach to healthcare.

Cost-Effectiveness:

Botanical interventions can be more cost-effective than conventional treatments.

Botanical interventions for depression:

Botanical interventions have been explored for their potential antidepressant activity, and several plants have shown promise in clinical studies. Here are some notable examples:

Saffron:

Recent studies support the use of saffron for depression, with a meta-analysis showing improvement in major depressive disorder and a systemic review indicating antidepressant activity similar to synthetic antidepressants [13].

Lavender:

Known for its calming scent, lavender has been shown in clinical trials to relieve mild forms of neurological disorders, depression, anxiety, and stress [14].

St. John's Wort:

This plant is effective in alleviating mild to moderate depression; however, it requires careful use due to possible interactions with other drugs [14].

Passion flower:

It has been found to produce benefits comparable to standard anxiolytics and antidepressants.

Chamomile:

This herb is also promising for mitigating anxiety or depression with favorable risk-benefit profiles compared to standard treatments.

Hypericum perforatum (St. John's Wort):

This plant is used for the treatment of depression [15].

Catha edulis (Khat):

Khat is a plant native to the Horn of Africa and the Arabian Peninsula. It has been used in traditional medicine, but its potential antidepressant effects need further research.

Tinospora cordifolia (Guduchi):

This is a herbaceous vine of the family Menispermaceae indigenous to the tropical areas of India, Myanmar, and Sri Lanka. It has been used in Ayurvedic medicine and has shown potential antidepressant activity.

Curcuma longa (Turmeric):

Curcumin, the active ingredient in turmeric, has shown potential antidepressant effects [16].

Ferula foetida (Asafoetida):

This plant has been used in traditional medicine, but its potential antidepressant effects need further research.

Rhodiola rosea (Golden root):

This plant is native to the arctic regions of Europe, Asia, and North America, and has been used in traditional medicine for its adaptogenic and antidepressant properties.

Glycyrrhiza glabra (Licorice):

Licorice root has been used in both Eastern and Western medicine to treat a variety of illnesses, including depression.

Crocus sativus (Saffron):
Saffron and its active constituents, such as crocin and safranal, have shown antidepressant activity.

Ocimum basilicum (Basil):
Basil has been used in Ayurvedic medicine for its potential antidepressant effects.

Embelica officinalis (Indian gooseberry):
This plant has been used in Ayurvedic medicine and has shown potential antidepressant activity.

It's important to note that while these plants can be helpful, more studies are needed to validate their mechanisms of action so that they can be used successfully and safely.

Case studies investigating the antidepressant activity of *Musa paradisiaca Linn:*

Anti-depressant effect of *Musa paradisiaca* The results of the forced swim test and the tail suspension test showed considerable antidepressant potential after administration of Musa paradisiaca extract (5, 10, and 20 % w/w once daily for 15 days in a succession). These results were given by Parle and Malik. Anticonvulsants such as baclofen (10 mg/kg, intraperitoneally), prazosin (62.5 mg/kg, intraperitoneally), and p-CPA (100 mg/kg, intraperitoneally) were shown to considerably prevent this reduction in immobility time. In addition, the levels of monoamine oxidase and malondialdehyde were significantly decreased with the utilisation of a paste prepared from *Musa Paradisiaca*. Based on these findings; it Is likely that the anti-depressant capability of the banana is connected to the anti-oxidant, proadrenergic, pro serotonergic, and/or Monoamine oxidase inhibitory activity. When administered to rats for a period of 14 days, the hydroalcoholic extract of Musa paradisiaca demonstrated a significant reduction for time spent immobile during both the forced swim test and the tail suspension test. Darji and Galani used dosages of 250 and 500 mg/kg, orally. The antidepressant effects of the extract were lessened when haloperidol was administered (0.1 mg/kg, i.p.), but increased when bromocriptine mesylate was administered (2 mg/kg, i.p.). Following treatment with extract for 14 days, neurochemical testing revealed increased levels of the neurotransmitters norepinephrine, dopamine, and serotonin in the patient's systems [17].

Case studies investigating the antidepressant activity of *Musa sapientum Linn:*

A document, research article titled "Effect of *Musa sapientum* Stem Extract on Animal Models of Depression" published in the journal Pharmacognosy Research. The study aimed to evaluate the antidepressant activity of *Musa sapientum* stem extract (MSSE) in experimental models in mice. The researchers conducted forced swim tests (FST) and tail suspension tests (TST) on different groups of mice (Table 1). The control group was administered distilled water, the standard drug group was given fluoxetine, and the three test groups were given incremental doses of 25, 50, and 100 mg of MSSE. The duration of immobility in the treated groups decreased compared to the control group in both tests. The difference in the duration of immobility was statistically significant at middle and higher doses (50 and 100 mg/kg MSSE) compared to the control group. The study concluded that MSSE showed significant antidepressant-like activity and could be a potential natural compound for use in depression [18].

Table 1. Effect of *Musa sapientum* Stem Extract (MSSE) on Immobility Duration in Mice [18].

Test	Control group (Duration of Immobility)	25 mg/Kg MSSE	50 mg/Kg MSSE	100 mg/Kg MSSE
Forced Swim Test (FST)	161.5 ± 6.78 s	149.33 ± 2.70	120.17 ± 8.35	45.17± 4.11
Tail Suspension Test (TST)	173.83 ± 12.65 s	163.17 ± 6.91	139.0 ± 5.9	124.0 ± 4.42

Data are presented as mean Standard deviation (n-3).

Case studies investigating the antidepressant activity of *Matricaria chamomile Linn:*

The study aimed to evaluate the antidepressant effects of chamomile (*Matricaria recutita*). With Experimental models using forced swim test (FST) and tail suspension test (TST) were conducted in mice. Where, Control Group Received distilled water. Standard Drug Group Administered fluoxetine (25 mg/kg) (Table 2). Test Groups: Given incremental doses of chamomile extract (25, 50, and 100 mg/kg). The results included in FST; immobility duration decreased significantly in the treated groups [19]. In TST, immobility duration also decreased significantly at 50 and 100 mg/kg chamomile. Additionally, chamomile has been found to have a mild sedative effect, which can be helpful in alleviating anxiety and soothing nerves during stress. Its potential role in anxiety and depression makes it an interesting natural remedy for further exploration [20].

Table 2. Summary of Chamomile Study Findings [19].

Aspect	Details
Experimental Models	- Forced Swim Test (FST) and Tail Suspension Test (TST) conducted in mice.
Control Group	Received distilled water
Standard Drug Group	- Administered fluoxetine (25 mg/kg).
Test Groups	Given incremental doses of chamomile extract: 25, 50, and 100 mg/kg.
FST Results	- Immobility duration decreased significantly in the treated groups.
TST Results	- Immobility duration also decreased significantly at 50 and 100 mg/kg chamomile.

In this experimental study, the effectiveness of *Matricaria chamomilla* and *Melissa officinalis* extracts was compared to the classic antidepressant drug, imipramine, using the forced swim test in adult mice. The study included 80 mice divided into 10 groups. Key findings include: Non-Reserpinized Mice; *Matricaria chamomilla* (50 mg/kg), *Melissa officinalis* (25 mg/kg), and imipramine (15 mg/kg) significantly reduced immobility duration in the forced swim test compared to the control group ($P < 0.01$) (Table 3), and Reserpinized Mice: Reserpinized mice administered *Matricaria chamomilla* (50 mg/kg) showed reduced immobility duration compared to the positive control group ($P < 0.01$). In conclusion, *Matricaria chamomilla* and *Melissa officinalis* exhibit antidepressant effects and could be considered for treating patients with depression.

Table 3. Antidepressant Effects of *Matricaria chamomilla* and *Melissa officinalis*.

Group	Treatment	Effect on Immobility Duration	Statistical Signi-ficance
Non-Reserpinized Mice	- *Matricaria chamomilla* (50 mg/kg) - *Melissa officinalis* (25 mg/kg) - Imipramine (15 mg/kg)	- Significantly reduced immobility duration in the forced swim test	- $P < 0.01$
Reserpinized Mice	Reserpinized mice administered *Matricaria chamomilla* (50 mg/kg)	Reduced immobility duration compared to the positive control group	- $P < 0.01$

This study highlights the potential therapeutic benefits of herbal extracts in managing depressive symptoms [21].

Antianxiety and Antidepressant Activities of Flower Extracts [21]:

The study aimed to evaluate the anxiolytic and antidepressant activities of ethanolic extracts of *Jasminum Sambac*, *Chamomilla capitula*, *Lilium candidum*, and *Sorghum helpense* Flowers. These were tested on albino mice using the elevated plus maze, actophotometer, forced swim test, and tail suspension test. The results showed that the combination of flower extracts (EEJSLC) significantly increased the number of open arm entries and time spent in the open arms in the elevated plus maze, indicating anti-anxiety activity. This was compared to the effects of individual extracts (EEJs, EELc, EESh, and EECc) (Table 4). A decrease in locomotor activity, an index of alertness, suggested a reduction in anxiety, similar to the effects of sedatives. In the forced swim test, EESh1, EESh2, and EECc2 significantly reduced immobility time in a dose-dependent manner, indicating antidepressant activity. However, the tail suspension test increased immobility time. The antidepressant effects of EEJSLC2 were comparable to the standard drug Diazepam (10 mg/kg i.p.), while EEJSLC1 had a highly significant effect. This study suggests potential therapeutic benefits of these flower extracts in managing anxiety and depression [22].

Table 4. Antianxiety and Antidepressant Activities of Flower Extracts [21].

Tested Extracts	Effects	Findings
EEJSLC (Combination)	Antianxiety Activity	- Increased open arm entries and time spent in open arms in the elevated plus maze. - Comparable to effects of sedatives.
Individual Extracts	Antianxiety Activity	- EEJs, EELc, EESh, and EECc.
Forced Swim Test	Antidepressant Activity	- EESh1, EESh2, and EECc2 significantly reduced immobility time in a dose-dependent manner.
Tail Suspension Test	Antidepressant Activity	- Increased immobility time.
Comparison to Diazepam	Antidepressant Effects	- EEJSLC2 comparable to standard drug Diazepam (10 mg/kg i.p.). - EEJSLC1 had a highly significant effect.

This study highlights the potential therapeutic benefits of these flower extracts in managing anxiety and depression.

***MUSA X PARADISIACA LINN* (PLANT PROFILE):**

This section provides detailed information on *Musa paradisiaca Linn and Matricaria recutita,* including their botanical characteristics, traditional uses, chemical composition, and pharmacological properties relevant to depression treatment.

Fig 12. ***Musa paradisiaca Linn.***

Synonyms:

Kadali, vaarnaa, Moeha, Ambusara and Anshumatiphala.

Common name: Banana stem.

Scientific name: *Musa x paradisiaca linn.*

Biological source:

Fresh stem or false stem (called pseudostem) of *Musa x paradisiaca linn* belongs to the family *Musaceae*.

Geographical source:

Bananas are native to Southeast Asia, Asia and South pacific and in other regions of the world; they can occasionally be found at especially Asian and Indian grocery stores. Banana evolved in the humid tropical regions of south East Asia with India as one of its centres of origin. Banana is the largest of herbivorous plants.

Morphology:

Pseudostem: What appears to be a trunk is actually a pseudostem. It is a compact arrangement of overlapping and spirally arranged leaf sheaths. The pseudostem provides support to the leaves and flowers. It is not a woody stem, but rather a collection of leaf bases. Inside this pseudostem, the true stem consists of three parts: Underground Rhizome: The rhizome serves as the starting point for the stem. It is where the growth begins. Aerial Stem, this part extends upward from the rhizome and bears the leaves. Peduncle: The peduncle attaches to the inflorescence (the flowering part of the plant). Suckers: These shoots arise from lateral buds on the rhizome. They take over and develop into fruit-bearing stems (Fig 12). In commercial plantations, the number of suckers is controlled through pruning. Root System: The roots, which play a crucial role in water and nutrient uptake, originate from the rhizome. The primary roots emerge from the surface of the central cylinder, while secondary and tertiary roots branch out from the primary ones.

Cultivation:

It grows in the areas of extreme temperatures and stormy conditions. Banana is cultivated in the tropical and subtropical regions of the world.

Chemical tests:

Test for flavonoids:

- Alkaline reagent test. Two to three drops of sodium hydroxide were added to 2 mL of extract. Initially, a deep yellow colour appeared but it gradually became colourless by adding few drops of dilute HCL, indicating that flavonoids were present.
- Shinoda's test. Ten drops of dilute HCl and a piece of magnesium were added to 1 ml of extract, the resulting deep pink colour indicating the presence of flavonoids.

Chemical constituents present in the plant are flavonoids: epicatechin, quercetin, apigenin glycosides, and myricetin-3-o-rutinoside.

Uses:

It has rich in medicinal qualities like antifungal, antibacterial and digestive aiding properties.

- It prevents kidney stones.
- Treating constipation.
- Weight loss.
- Treating anemia.
- It is good for diabetic.
- Regulates blood pressure.
- Helps in detoxification.

***MATRICARIA CHAMOMILE LINN* (PLANT PROFILE):**

Synonyms:

Anthemis, chamomilla, matricaria.

Common name: Chamomile tea

Scientific name: *Matricaria chamomilla linn*

Fig 13. Matricaria recutita.

Biological source:

Dried flower buds or leaves of the *matricaria chamomilla linn*, belongs to the family *Asteraceae*.

Geographical source:

It is an essential medical herb indigenous to Europe and Asia. it is grown in southern and eastern Europe, northern Africa, central and western Asia and western north America.

Morphological characters:

Leaves - Long and narrow, bi-to triponnate. Stem - 10 to 8 cm height. Flower heads - 10 to 30 cm in diameter and they are pedunculate and heterogamous (Fig 13). Colour of flower buds: golden yellow tubular florets with 5 feet and 1.5 to 0.5 mm long.

Cultivation:

German chamomile can be grown on any type of soil, but growing the crop on rich, heavy and damp soils should be avoided. It can also withstand cold weather with temperature ranging groom 2 to 20°C. The crop has been grown very successfully on the poor soils (loamy sand) with pH of 9. Soils with pH of 902 are reported to support its growth. Chamomile possess a high degree of tolerance to soil alkalinity.

Propagation:

The plant is propagated by seeds, weigh 0.8 to 0.153 g. The crop can be grown by two methods,

- Direct sowing of the seed.
- Transplanting.

Optimum temperature for good seed germination lies between 10 and 20 ºC.

Collection/ Harvesting:

Hand picking (laboratory intensive operation).

Chemical tests:

Test for flavonoids:

- Alkaline reagent test. Two to three drops of sodium hydroxide were added to 2 ml of extract. Initially, a deep yellow colour appeared but it gradually became colourless by adding few drops of dilute HCL, indicating that flavonoids were present.
- Shinoda's test. Ten drops of dilute HCL and a piece of magnesium were added to 1 mL of extract, the resulting deep pink colour indicating the presence of flavonoids.

Chemical constituents:

As secondary metabolites including terpenoids, flavonoids [apigenin(R=H), apigenin-7-o glueoside(R=H), Quercertin].

Uses:

- It is a component of several traditional unani and homeopathic medicinal preparations.
- It is used for the treatment of mild skin irritation
- To treat anxiety
- To treat inflammation and spasm as a sedative
- As a drug, it is useful in flatulence, colic, hysteria, depression, ulcer and wound healing, etc.

ANTIDEPRESSANT EFFECTS OF *MUSA PARADISIACA LINN*:

A comprehensive review of preclinical and clinical studies investigating the antidepressant effects of *Musa paradisiaca Linn*. This section examines the efficacy, safety, and mechanisms of action underlying its potential antidepressant properties. *Musa paradisiaca Linn. stem*, a part of the banana plant, has been studied for its potential antidepressant effects.

Efficacy:

Preclinical studies have shown that extracts from the stem of *Musa paradisiaca* exhibit antidepressant activity [23]. *For instance, a study found that the methanolic extract of Musa sapientum* stem (a close relative of *Musa paradisiaca*) produced significant antidepressant activity. In the Forced Swim Test (FST) and Tail Suspension Test (TST), the duration of immobility decreased significantly in the groups treated with *Musa sapientum* stem extract (MSSE), suggesting an antidepressant-like activity [23].

Safety:

Musa paradisiaca is a widely consumed plant globally, and it has generally considered safe. However, specific

safety studies related to its use as an antidepressant are not readily available. It is important to note that while the plant is generally safe for consumption, the safety of concentrated extracts or supplements may vary, and should be used under the guidance of a healthcare professional [24].

Mechanisms of Action:

- The antidepressant activity of *Musa paradisiaca* may be mediated through improvements in the glycemic state, β-cell function, tissue insulin sensitivity, and antioxidant defense mechanism [25].
- The presence of active compounds such as flavonoids, terpenes, alkaloids, and saponins in the plant extracts could contribute to its antidepressant effects [26].

ANTIDEPRESSANT EFFECTS OF *MATRICARIA RECUTITA*:

A similar analysis of the antidepressant effects of *Matricaria recutita*, encompassing preclinical and clinical evidence, safety considerations, and proposed mechanisms of action.

Matricaria recutita, commonly known as chamomile, has been studied for its potential antidepressant effects. Here is a summary of the findings:

Efficacy:

Preclinical studies have shown that extracts from *Matricaria recutita* exhibit antidepressant activity [27]. For instance, a study found that chamomile extract might produce clinically meaningful antidepressant effects in addition to its anxiolytic activity in subjects with Generalized Anxiety Disorder (GAD) and comorbid depression [28]. In another study, it was observed that chamomile might have a greater reduction in depression symptoms in subjects with GAD and comorbid depression.

Safety:

Matricaria recutita is a widely consumed plant globally, and it is generally considered safe [29]. However, specific safety studies related to its use as an antidepressant are not readily available.

It's important to note that while the plant is generally safe for consumption, the safety of concentrated extracts or supplements may vary, and should be used under the guidance of a healthcare professional.

Mechanisms of Action:

The antidepressant activity of *Matricaria recutita* may be mediated through the regulation of T-cell lymphatic subpopulations to inhibit the cell differentiation-signaling pathway [30]. The presence of active compounds such as flavonoids, terpenoids, and coumarins in the plant extracts could contribute to its antidepressant effects [30].

COMPARATIVE ANALYSIS:

This section compares and contrasts the antidepressant effects of *Musa paradisiaca Linn* and Matricaria recutita, highlighting similarities, differences, and potential synergistic effects when used in combination

Musa paradisiaca Linn. and *Matricaria recutita* are both studied for their potential antidepressant effects. Here is a comparison and contrast of their antidepressant properties:

Similarities:

- Both plants have shown significant antidepressant activity in preclinical studies[12].
- The antidepressant effects of both plants are thought to be mediated through the presence of active compounds such as flavonoids, terpenoids, and other phytochemicals [31].

Differences:

- *Musa paradisiaca Linn.* has been found to exert its antidepressant effects possibly through α1-adrenergic and D2 dopaminergic receptors [30].
- On the other hand, *Matricaria recutita* is thought to exert its antidepressant effects through improvements in the glycemic state, β-cell function, tissue insulin sensitivity, and antioxidant defense mechanism [32].

POTENTIAL SYNERGISTIC EFFECTS:

While there are no specific studies on the synergistic effects of *Musa paradisiaca Linn.* and *Matricaria recutita* when used in combination, it's plausible that combining these two plants could potentially enhance their antidepressant effects. This is because they seem to work through different mechanisms of action, and thus might complement each other. However, this hypothesis would need to be confirmed through rigorous scientific studies.

MECHANISMS OF ACTION:

An in-depth exploration of the mechanisms underlying the antidepressant effects of *Musa paradisiaca Linn and Matricaria recutita*, including neurotransmitter modulation, anti-inflammatory effects, neuroprotective properties, and antioxidant activity.

***Matricaria recutita* (Chamomile)**:
Matricaria recutita, commonly known as chamomile, is a medicinal plant that has been used for centuries due to its wide range of therapeutic properties. It is rich in various bioactive compounds such as flavonoids, terpenoids, and coumarins [33]. These compounds are responsible for its medicinal properties.

Neurotransmitter Modulation:
Chamomile has been found to exhibit antidepressant activity in humans with co-morbid anxiety and depression symptoms [34]. This is thought to be due to its ability to modulate neurotransmitters, which are chemicals that transmit signals in the brain [35].

Neuroprotective Properties:
Chamomile has shown potential neuroprotective effects. For instance, it has been found to have a protective effect against oxidative stress in the brain [36].

Antioxidant Activity:
Chamomile is known for its antioxidant properties. Antioxidants are substances that can prevent or slow damage to cells caused by free radicals, which are unstable molecules that the body produces as a reaction to environmental and other pressures.

Anti-inflammatory Effects:
Chamomile has demonstrated anti-inflammatory effects. Inflammation is a natural response of the body to injury or illness, but chronic inflammation can contribute to various health problems.

***Musa paradisiaca Linn*. (Banana Stem):**
Musa paradisiaca Linn. commonly known as the banana stem, is another plant that has been used in traditional medicine.

Antidepressant Activity:
The fruit of the banana that contains high concentration of serotonin, norepinephrine, and dopamine. The peel of fruit contains serotonin (47 to 93 g/g), norepinephrine (122 g/g), and dopamine (700 g/g). Banana also contains tryptophan that helps in restoration of essential neurotransmitters. In addition, banana is a rich source of various nutritional elements that can help in treatment of mood disorders. Bananas are a rich source of several nutrients, including those that can assist in the treatment of mood disorders [39].

Neurotransmitter Modulation:
The stem of *Musa paradisiaca* has been found to have antidepressant-like effects in animal models. This is thought to be due to its ability to modulate neurotransmitters.

Neuroprotective Properties:
The stem of *Musa paradisiaca* has shown potential neuroprotective effects. For instance, it has been found to have a protective effect against oxidative stress in the brain.

Antioxidant Activity:
The stem of *Musa paradisiaca* is known for its antioxidant properties [37]. As mentioned earlier, antioxidants can prevent or slow damage to cells caused by free radicals. Extracts of Musa paradisiaca were found to stimulate the activities of superoxide dismutase (SOD) and catalase, which may be responsible for the lower levels of peroxidation products such as hydroperoxides. Methanol extracts of Banana flower have inhibitory effects that stabilize the free radicals produced because of several metabolic processes in the body. If the free radicals do not appear to be neutral, their unsteady electrons interact with the polymer and proteins of human cells and change their characteristics. This can lead to a various chronic condition, including cancer and cardiovascular disease. As a result, banana flower extract is extremely useful in the development of antioxidant supplements to prevent oxidation in humans [38].

Anti-inflammatory Effects:
The stem of *Musa paradisiaca* has demonstrated anti-inflammatory effects [39]. In conclusion, both *Matricaria recutita* and *Musa paradisiaca Linn.* have shown potential as natural antidepressants due to their ability to modulate neurotransmitters, protect the brain from oxidative stress, and their antioxidant and anti-inflammatory properties. However, more research is needed to fully understand these effects and their implications for the treatment of depression.

SAFETY PROFILE:
A critical evaluation of the safety profiles of *Musa paradisiaca Linn* and *Matricaria recutita*, including potential adverse effects, drug interactions, and considerations for special populations.

***Musa paradisiaca Linn* (Banana Stem):**
Safety profile:
Musa paradisiaca Linn. is generally considered safe for consumption. It has been used in traditional Ayurvedic medicine for centuries to treat various ailments,

including ulcers, wounds, and burns. However, like any substance, it can cause adverse reactions in some individuals.

Potential Adverse Effects:
Some individuals may experience allergic reactions to *Musa paradisiaca Linn*, such as contact dermatitis. This is a type of skin inflammation caused by direct contact with an allergen. Symptoms can include redness, itching, and swelling.

Drug Interactions:
There is limited information available on the potential drug interactions *of Musa paradisiaca Linn*. However, it is always recommended to consult with a healthcare provider before starting any new treatment, especially if you are currently taking other medications.

Special Populations:
There is no specific information available about the use of *Musa paradisiaca* Linn in special populations like pregnant women, nursing mothers, or people with certain medical conditions. As always, it is best to consult with a healthcare provider for personalized advice.

***Matricaria recutita* (Chamomile):**
Safety Profile:
Matricaria recutita is generally regarded as safe. It has commonly used for its antioxidant, antimicrobial, antidepressant, anti-inflammatory, antidiarrheal activities, and more.

Potential Adverse Effects:
Side effects are uncommon but may include nausea, dizziness, and allergic reactions. Rare cases of anaphylaxis, a life-threatening allergic reaction, have occurred in people who consumed or encountered chamomile products.

Drug Interactions:
Interactions between chamomile and certain drugs like cyclosporine (a drug used to prevent rejection of organ transplants) and warfarin (a blood thinner) have been reported. Chamomile may also interact with non-heme iron, reducing its absorption.

Special Populations:
Individuals with known allergy to members of the *Asteraceae/ Compositae* family should use caution. The use of chamomile during pregnancy is not recommended due to lack of data.

In conclusion, while these plants have been used for their medicinal properties, it is important to consult with a healthcare provider before starting any new treatment. This is especially true if you are taking other medications or have any health conditions. It is also crucial to remember that while these plants have shown potential in treating depression, they should not replace conventional treatments unless advised by a healthcare provider.

CLINICAL IMPLICATIONS:

This section discusses the clinical relevance of the findings, implications for depression treatment, and recommendations for incorporating *Musa paradisiaca Linn* and *Matricaria recutita* into clinical practice.
The findings on the antidepressant effects of *Musa paradisiaca Linn* and *Matricaria recutita* have significant clinical relevance.

Clinical Relevance:
- The potential antidepressant effects of these plants could provide alternative or complementary treatment options for depression, a condition that affects millions of people worldwide.
- The use of natural products in mental health care is gaining acceptance due to their perceived safety and cultural acceptability.
- These plants could be particularly useful in settings where access to conventional antidepressants is limited or where these medications are not well tolerated.

Implications for Depression Treatment:
- The findings suggest that these plants could be used as part of a comprehensive treatment plan for depression, which may include psychotherapy, lifestyle changes, and other interventions.
- However, more research is needed to determine the optimal dosage, formulation, and duration of treatment with these plants.
- It's also important to consider potential interactions with other medications and the suitability of these plants for different patient populations.

Recommendations for Clinical Practice:
- Healthcare providers should be aware of the potential antidepressant effects of these plants and consider them as part of a holistic approach to depression treatment.

- However, they should also be mindful of the limitations of the current evidence base and the need for further research.
- Patients should be advised to consult with their healthcare provider before starting any new treatment, including natural products.
- Finally, the use of these plants should not replace conventional treatments for depression unless advised by a healthcare provider.

In conclusion, while the findings on the antidepressant effects *of Musa paradisiaca Linn* and *Matricaria recutita* are promising, more research is needed to fully understand their potential benefits and risks.

FUTURE DIRECTIONS:

A discussion of future research directions, including the need for well-designed clinical trials, elucidation of mechanisms of action, identification of optimal dosing regimens, and exploration of novel botanical interventions for depression.

The potential antidepressant effects of *Musa paradisiaca Linn* and *Matricaria recutita* present exciting avenues for future research. Here are some key directions that could be pursued.

Well-Designed Clinical Trials:

While preclinical studies provide valuable insights, well-designed clinical trials are crucial to validate these findings. These trials should aim to determine the efficacy of these plants in reducing depressive symptoms, their safety profiles, and any potential side effects. Randomized controlled trials, considered the gold standard in clinical research, would be particularly useful.

Elucidation of Mechanisms of Action:

Understanding the exact mechanisms through which these plants exert their antidepressant effects is another important area of research. This could involve exploring their effects on various neurotransmitter systems, their anti-inflammatory and neuroprotective properties, and their antioxidant activity. Advanced techniques such as neuroimaging and genomics could be employed for this purpose.

Identification of Optimal Dosing Regimens:

Determining the optimal dosing regimens for these plants is another critical aspect. This would involve investigating the appropriate dosage, frequency, and duration of treatment. Factors such as the patient's age, weight, and overall health status would need to be considered.

Exploration of Novel Botanical Interventions for Depression:

Beyond *Musa paradisiaca Linn* and *Matricaria recutita,* there are numerous other plants with potential antidepressant properties. Identifying and studying these plants could lead to the development of novel botanical interventions for depression.

In conclusion, while the initial findings on the antidepressant effects of *Musa paradisiaca Linn* and *Matricaria recutita* are promising, there is a need for further rigorous and comprehensive research in this field. The ultimate goal is to improve the range of effective, safe, and accessible treatments available for depression. As always, individuals should consult with a healthcare provider before starting any new treatment.

RECENT ADVANCEMENTS:

Let us discuss the recent advancements in the research of *Musa paradisiaca Linn* stem and *Matricaria recutita* leaves.

Musa paradisiaca Linn:

Recent studies have highlighted the extensive usage of *Musa paradisiaca* in traditional medicine across continents**.** The plant has been found to have antimicrobial, antioxidant, anti-inflammatory, antiulcer, hypoglycemic, hypolipidemic, cardioprotective, hepatoprotective, neuroprotective, nephroprotective, anti-diarrheal, antispasmodic, wound healing, and anticancer properties. The pharmacological properties of *Musa paradisiaca* are attributed to its rich reservoir of phytochemical constituents, primarily its flavonoids, such as luteolin, apigenin, and quercetin, as well as its sesquiterpenes, mainly chamazulene and (−)-α-bisabolol.

A study on the methanolic stem extract of *Musa paradisiaca Lin*n showed significant wound healing activity in Wistar albino rats. The extract was found to exhibit significant hypolipidaemic and hypoglycaemic activity in rats. The flower extract exhibited hypoglycaemic activity in rabbits. The pseudostem is reported to possess lithotriptic and antilithic properties [40].

Another study investigated the in vitro antidiabetic potential of the stem part of *Musa paradisiaca* Linn. The study found that various phytochemicals are present in the hydro-alcoholic and methanolic extracts, which

showed the inhibitory effect towards alpha amylase and alpha-glucosidase enzymes.

Matricaria recutita:

Matricaria recutita, commonly known as chamomile, is a medicinal plant that has been used for centuries due to its wide range of therapeutic properties. It is rich in various bioactive compounds such as flavonoids, terpenoids, and coumarins. These compounds are responsible for its medicinal properties [40].

A review study elucidated and discussed the recent findings for *Matricaria recutita* development as a therapeutic agent that possesses health-promoting, disease-preventing and even treatment properties [42]. The traditional medicinal uses and evidence-based research studies, which were performed in cell culture, animal models and human subjects to assess the pharmacological activities of *Matricaria recutita*, are extensively highlighted.

In conclusion, while these plants have shown potential in these areas, more research is needed to fully understand their mechanisms and potential therapeutic applications.

FUTURISTIC APPROACHES:

Integrative Medicine:

Explore the potential for integrating *Musa paradisiaca* and *Matricaria recutita* into holistic treatment plans that combine conventional and complementary therapies.

Genetic Modifications:

Engineering of plants to increase the concentration of active compounds.

Novel Drug Delivery Systems:

Development of nano-carriers and other advanced drug delivery systems to enhance bioavailability and efficacy.

Personalized Medicine:

Tailoring treatments based on and microbiome profiles to maximize efficacy and minimize side effects.

Digital Health Tools:

Utilizing mobile apps and wearable devices to monitor treatment progress and adherence.

Biotechnological Advances:

Explore the potential for biotechnological advancements, such as gene editing and synthetic biology, to enhance the efficacy and safety of herbal antidepressants.

CONCLUSION:

A summary of key findings and conclusions drawn from the systematic review, emphasizing the potential of *Musa paradisiaca Linn* and *Matricaria recutita* as alternative or adjunctive treatments for depression and highlighting avenues for future research. The systematic review highlights the potential of *Musa paradisiaca Linn* and *Matricaria recutita* as alternative or adjunctive treatments for depression. Both plants have shown significant antidepressant activity in preclinical studies, with *Musa paradisiaca Linn* demonstrating a decrease in immobility duration in forced swim and tail suspension tests and *Matricaria recutita* exhibiting antidepressant-like effects in subjects with generalized anxiety disorder and comorbid depression. The mechanisms of action underlying their antidepressant effects include neurotransmitter modulation, anti-inflammatory effects, neuroprotective properties, and antioxidant activity. However, more research is needed to fully understand these mechanisms and their implications for depression treatment. Future research directions include conducting well-designed clinical trials to validate the findings, elucidating the optimal dosing regimens, and exploring novel botanical interventions for depression. The review highlights the clinical relevance of these findings and their implications for depression treatment. The potential of *Musa paradisiaca Linn* and *Matricaria recutita* as natural antidepressants provides alternative options for individuals who may not tolerate or have limited access to conventional antidepressant medications. Future research directions include conducting well-designed clinical trials to validate the efficacy and safety of these plants, elucidating their mechanisms of action, identifying optimal dosing regimens, and exploring novel botanical interventions for depression. In conclusion, the systematic review underscores the potential of *Musa paradisiaca Linn* and *Matricaria recutita* as alternative or adjunctive treatments for depression. However, further research is needed to fully understand their effects and optimize their use in clinical practice. These botanical interventions offer promising avenues for future research and may provide additional options for individuals seeking natural remedies for depression.

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