Research Article
CODEN (USA): IJPLCP

ISSN: 0976-7126
Shah *et al.*, 12(10):31-41, 2021

International Journal of Pharmacy & Life Sciences
Open Access to Researcher

Pharmacological Screening of *Cassia grandis* Leaves for Antidepressant Activity

Renu Shah[1]*, Manju Prajapati[1], Pradeep Kumar Mohanty[1] and Janki Prasad Rai[1]

School of Pharmacy, LNCT University, Bhopal (M.P.)-India

Article info

Received: 08/09/2021

Revised: 21/09/2021

Accepted: 24/10/2021

© *IJPLS*

www.ijplsjournal.com

Abstract

Mental depression is a distresses person's mood, thoughts, physical health and behavior with chronic illness. The biological and emotional components are also attach with symptoms of depression. The retardation of thought, action and appetite are biological symptoms & emotional indicators include mystery, apathy and pessimism, low self-esteem consisting of feeling of guilt, inadequacy and ugliness, indecisiveness and loss of motivation. Patients with major depression have symptoms that reflect changes in brain, monoamine neurotransmitters, specifically nor epinephrine, serotonin, dopamine. The reasons for the disease include stimulation of MAO-A, inhibition of NA and 5-HT. Symptoms include the diminished interest of pleasure, feelings of worthlessness or inappropriate guilt, a decrease in appetite and libido, insomnia, and recurrent thoughts of death or suicide. Many scientists are researching plant material for treating this disorder and there are lots of publications on it. Several drug-drug interactions can also occur. These conditions create an opportunity of alternative treatment for depression by the use of medicinal plants. Since all the synthetic drugs available for the treatment of depression have various adverse effects associated with problematic interactions, our aim is to explore the potential of medicinal plants in the management of depression. The present study is proposed cassia grandis leaves have more potent activity for management of depression due to presence of more phytochemical constituents. These phytochemivcal constituents have antidepressant activity as previous scientist work.

Thus, the proposed part of plant have maximum potent phyochemical constituent for justified the proposed work.

Stress renders an individual to experience mental pressure and exhaustion which brings about feelings of anxiety, depression, anger and/or other negative emotions. Depression affects a person's state of mind, behaviour, health and is often associated with suicide. The use of anti-depressant drugs as therapeutic agents is associated with symptoms such as, delayed onset of action, side-effects, drug–drug and dietary interactions, sexual dysfunction, cardiac toxicity, etc. Thus, there is need to target these issues and improve current treatment options. Medicinal plants have long been used in discovering novel treatment strategies and compounds with promising roles in treating various disease conditions. There has been an increase, worldwide, in the use of medicinal plants and herbs for developing nutraceuticals for treatment of depression and other psychiatric disorders. Medicinal plants in their natural forms are valuable as they are rich in various phytochemical compounds. These phytochemical compounds have pharmacological roles in treating various diseases conditions; apart from being widely available in nature and commercially beneficial. The phytochemical compounds in plants are constantly being explored through various experimental studies to determine the molecular basis of how medicinal plants work in relation to drugs and diseases and to develop neutraceuticals for improving conditions. The various mechanisms of anti-depressant action of some of proposed plants parts like roots, stem, leaves, flowers, fruit; phytochemical compounds showing anti-depressant activity such flavanoids, steroids, saponins, sugars, lectins, alkaloids, etc.; and various anti-depressant screening models used such as tail suspension test, forced swim test, chronic unpredictable stress test, sucrose preference test, monoamine oxidase inhibition assay, learned helplessness test, open field test, hole board test, etc. However, mechanistic evaluation of many of these plants still needs to be investigated and explored.

Key-words: Cassia, Pharmacology, Depressant

Introduction

World Health Organization (WHO, 2013) defines mental health as a state of well-being and may contribute to his/her community[1].Mental health is a dynamic state of inner stability which enables individuals to use their abilities in harmony with universal values of society. Mental health and mental illness determined by multiple and interacting social, psychological, and biological factors, just as health in general.Various researchers found that mental illness and weak economic status are related.

***Corresponding Author**

The relationship between poverty and mental disorders is universal and found across societies irrespective of levels of development. Hopelessness, insecurity, rapid social change, the risks of violence and disease are factors responsible for the vulnerability of poor people to mental illnesses [2].Mental disorders include various types of problems, with different symptoms. However, they are usually characterized by some combination of abnormal thoughts, emotions, behavior, and relationships with others. Mental disorders today are conceptualized as behavioral or psychological syndromes that occur in a person in response to the distress, disability or suffering, not merely the expectable or usual response to a particular event [3].A mental disorder is a syndrome characterized through clinically significant disturbance in an individual's cognition, emotion, regulation or behavior that reflect a dysfunction in the psychological, biological or developmental processes underlying mental functioning mental disorder are usually associated with distress or disability in social life, occupational or other activities[4].Depression is a severe problem of every age group in wold wild but In Western countries depression and schizophrenia are most often seen by the public as caused by the social environment, particularly recent stressors[5]. Depression is a potentially life -threatening disorder that affects hundreds of millions of people all over the world. The first major hypothesis of depression was formulated about 30 years ago and proposed that the main symptoms of depression are due to a functional deficiency of the brain monoaminergic transmitters norepinephrine (NE), 5-HT, and/or dopamine (DA), whereas mania is caused by functional excess of monoamines at critical synapses in the brain. Many attempts have been made to prove the hypothesis of reduced monoamine availability by measurement of neurotransmitters and/or their metabolites in postmortem brain tissues and body fluids, such as cerebrospinal fluid (CSF), blood, and urine.38 Although repeated data showing decreased levels of the NE metabolite a-methoxy-4-hydroxyphenylglycol (MHPG), which indicates NE. turnover in brain, support the hypothesis of a deficient noradrenergic system, the results are inconsistent. Similarly to the noradrenergic system, the data on determinations of 5-HT and its metabolite 5-hydroxyindoleacetic acid (5-HIAA) could not prove the hypothesis of exclusively reduced serotonergic transmission. Many studies reported decreased central serotonergic turnover in major depression; but findings also suggested that reduced 5-HT function may not be present in all depressed patients. These discrepancies between studies may reflect both methodological problems, such as difficulties in measuring the amines after various postmortem delays, and the fact that determinations of neurotransmitters or their metabolites in CSF or blood reflect a summation of many events in many brain areas and not in restricted nuclei[18].The availability of antidepressant drugs has expanded greatly, not only in terms of number, but also, and especially, in terms of diversity in the associated pharmacological effects.The main problem with the less severe side effects is a reduction in compliance, patients often do not take a sufficient dosage for an adequate period of time and thus remain in an "undertreated" state[19].

Cassia grandis is a medium-sized tree, up to 20(-30) m tall, semi-deciduous, young branches and inflorescence covered with rusty lanate indumentum.Leaves with 10-20 pairs of leaflets, petiole 2-3 cm long, lanate, leaflets subsessile, elliptical-oblong, 3-5 cm x 1-2 cm, subcoriaceous, rounded at both ends.Inflorescence a lateral raceme, 10-20 cm long, 20-40-flowered; flowers with sepals 5-8 mm long, petals initially red, fading to pink and later orange, the median one red with a yellow patch, stamens 10 with hirsute anthers, 3 long ones with filaments up to 30 mm and anthers 2-3 mm long, 5 short ones with filaments 7-9 mm and anthers 1-1.5 mm long, 2 reduced ones with filaments about 2 mm long.C. grandis is a common element of lowland and riparian, semi-deciduous forests.

The pharmacological activities of Cassia species have been reported such as hepatoprotective activity, anti-inflammatory activity, hypolipidemic activity, antimutagenic activity, antibacterial activity, antiulcer activity, antifungal activity, antioxidant activity

Material and Methods

Extraction &Phyochemical Screening: All chemicals and solvents were of analytical grade

(AR Grade) and were purchased from Sigma Aldrich, Ranbaxy fine chemicals Ltd., LOBA chemicals Ltd., s.d. fine chemicals Ltd., Spectrochem chemicals. Pre-coated TLC plates having silica gel 60 F254 thickness 0.2 mm were purchased from Merck. All the solvents used for HPLC analysis were purchased from JT Baker and Fischer scientific Ltd.

Collection and authentication of plant material: The selected plant material ***Cassia Grandis* leaves** were purchased from local market of Bhopal, (M. P.) India, and authenticated by botanist, dept. of botany, Barkatullah University, Bhopal. Voucher specimens are submitted to botany department, Barkatullah University, Bhopal. (M.P.)

Macroscopic studies: The selected crude drugs were subjected to studies organoleptic characters viz., color, odour, appearance, taste, texture etc.

Figure 1: Morphological evaluation of selected crude drugs (*Cassia Grandis* leaves)

Table 1: Organoleptic identification of *Cassia Grandis* leaves

S. No.	Parameters	Observations *Cassia Grandis* leaves
1	Shape	narrow and elliptical
2	Size of leaflets	6 * 1.5 cm
4	Odour	Strong and characteristic
5	Taste	Bitter and astringent
6	Colour	Green
7	Foreign organic matter	No adulterants have been found

The compound leaves are 30 cm x 10 cm, paripinnated and alternate with 8-20 pairs of leaflets. The leaflets have size 6 x 1.5 cm, narrow and elliptical, downy beneath, green above and are pink when young.

Physicochemical Evaluation: Physiochemical qualities, for example, ash values and extractive values were researched for chose plant as the official strategies and as per WHO guidelines. Ash values (Total ash, Acid insoluble ash and Water soluble ash), Extractive values, Loss on drying and pH were determined for *Cassia Grandis* leaves.

Table 2: Physicochemical parameters of *Cassia Grandis* leaves

S. No.	Physicochemical parameter values (% w/w)	*Cassia Grandis* leaves
1	Total ash	10.01
2	Water soluble ash	4
3	Acid insoluble ash	0.3
4	Moisture content	5.4
5	Foreign organic matter determination	1.1

Table 3: Solvent extractive values (% w/w) of *Cassia Grandis* leaves

S. No.	Name of extract	Extractive value *Cassia Grandis*
1	Alcohol soluble extractive value	10.62 % w/w
2	Water soluble extractive value	12.4 % w/w

Extraction Process of Drug: Extraction includes partition of bioactive segment of the plant tissues from the latent moeity by utilizing specific solvents in standard extraction systems. Plant herbs were extracted successively with hexane, and methanol utilizing maceration method of extraction. The totally dried leaves of ***Cassia Grandis*** was coarsely powdered and afterward extracted with non polar solvent hexane for defatting of plant material. Leaves powder (200g) were stuffed in vessel and kept with hexane for 24 hours and procedure was repeated till complete extraction. The plant material then kept with methanol for 24 hours and procedure was repeated till complete extraction. The obtained methanol

extract were filtered and concentrated on rotatry evaporator to get methanol extract.

Prelimnary phytochemical analysis of extracts: Qualitative test as Phytochemical examination of any plant species is a vital procedure as it give the starter data about presence of different chemical constituents and furthermore gives further possibilities of the specific plant species in its future research examinations. The extracts acquired by extraction methods were exposed to different chemical tests to recognize the presence of a class of chemical constituents i.e. presence of alkaloid, carbohydrates,glycoside, phytosterols and triterpenoids.protein and amino acids phenolic and tannins, flavonoids,oils and fats and saponins **(Kokate, 2001)**

Table 4: Phytochemical analysis of *Cassia Grandis leaves* extracts

S. No.	Phytochemical	Indication test	Methanol extract
1	Alkaloid	Dragendorff test	+
2	Napthoquinon	Juglone test	+
2	Steroid	Salkowaski test	+
3	Carbohydrates	Molish test	+
4	Triterpene	Vanillin-sulphuric acid test	+
5	Tannin	Ferric chloride test	+
6	Glycosides	Keller-killani test	+
7	Protein	Biuret test	+
8	Flavonoid	Shinoda Test	+
9	Saponin	Lead acetate test	+

Where + is Present and – is Absent

In-vivo pharmacological screening (Anti-depresant activity)

Drugs and Chemicals:All the biochemicals employed in these investigations were of highest purity and procured from Sigma company USA, Merck Germany, Sisco Research Laboratory, Mumbai, Qualigens Mumbai, Across Organics Mumbai, Spectrochem, Mumbai or S.D. Fine chemicals Mumbai. All the organic solvents were of AR grade.Spectrophotometer (Schimatzu model UV 1601) double beam, spectroflurometer (Elico model), refrigerated super speed centrifuge (Sorvall RC-5B model), light microscope (Lynx, Lawrence and Mayo) were used for the preparation and estimation of biological samples.

Experimental animals:The animal experiments, male mice weighing about 100-125g were used. These mice had can be able to access laboratory feed and water under standard laboratory conditions. The animals used in the present study were maintained in accordance with the guidelines of National Institute of Nutrition, India and approved by Institutional Animal Ethics Committee (IAEC) and reference no is IAEC/918/CPCSEA/1Mph dated 10/04/21 at B.R. Nahata College of Pharmacy, Mandasur(M.P). Experiments performed by an observer who was unaware of the each treatment, were carried out between 1- 3p.m. For the behavioral test, different doses of the extract were separately suspended in a vehicle comprising 1% (w/v) tween 20 in distilled water and a standard drug (amitriptyline and fluoxetine) were given by gastric gavage once a day over a period of 1,3, 7, 14 and 21days. Behavioral test was conducted 1 hour after the last treatment/administration.

A. Forced swimming test (FST):

Animal groups:The activity was performed with 48 total mice. We were randomly divided into 6 groups, each group having 8 mice. The mice of each group was treated accordingly treatment given in Table 6.5and treated as follows: Group 1 act as normal control and Group 2 have tween-20 suspensions and act as experimental control (FST group). Group 3-5 were orally administered with various doses of methanol extract of cassia grandishaving three different doses. Group 3 treated as 75mg extract/kg of body weight, Group 4 treated as 150 mg extract/kg of body weight, Group 5 treated as 300 mg extract/kg of body weight. The animals present in Group 6 and 7 received standard anti- depressant drug-amitriptyline and fluoxetine (10 mg/kg body weight).

Table 5:Experiment animal groups (FST)

Animal groups	Treatment
Group 1	Normal control
Group 2	Tween-20 suspensions + FST
Group 3	CGMeOH (75mg/kg b wt.) + FST
Group 4	CGMeOH (150mg/kg b wt.) + FST
Group 5	CGMeOH (300mg/kg b wt.) + FST

Group 6	Amitriptyline (10mg/kg b wt.) + FST
Group 7	Fluoxetine (10mg/kg b wt.) + FST

CG Methanolic extract was suspended in a vehicle comprising 1% (w/v) tween 20 in distilled water (75, 150 and 300 mg extract/kg of body weight).

Experiment design:The FST conducted in mice as all the groups of mice were subjected to swimming test except group 1 in a cylindrical glass aquarium (50 x 30 cm diameter), containing 25±2ºC water. Mice were allowed to swim for 6 min and the duration of immobility was measured during the final 4 min interval of the test using a video tracking system. Immobility period was regarded as the time spent by the mouse floating in the water without struggling and making only those movements necessary to keep its head above the water. Following swimming sessions, they were then towel dried. In order to determine the time-dependent effects on immobility time, oral treatments with CG MeOH for 1, 3, 7, 14 and 21 consecutive days were investigated[39-40].

B. Tail suspension test (TST):

Animal groups:The activity was performed with 48 total mice. We were randomly divided into 6 groups, each group having 8 mice. The mice of each group were treated accordingly treatment given in Table 6.6and treated as follows: Group 1 act as normal control and Group 2 have tween-20 suspensions and act as experimental control (TST group). Group 3-5 were orally administered with various doses of methanol extract of cassia grandishaving three different doses. Group 3 treated as 75mg extract/kg of body weight, Group 4 treated as 150 mg extract/kg of body weight, Group 5 treated as 300 mg extract/kg of body weight. The animals present in Group 6 and 7 received standard anti- depressant drug-amitriptyline and fluoxetine (10 mg/kg body weight).

Table 6: Experiment animal groups (TST)

Animal groups	Treatment
Group 1	Normal control
Group 2	Tween-20 suspensions + TST
Group 3	CGMeOH (75mg/kg b wt.) + TST
Group 4	CGMeOH (150mg/kg b wt.) + TST
Group 5	CGMeOH (300mg/kg b wt.) + FST
Group 6	Amitriptyline (10mg/kg b wt.) + TST
Group 7	Fluoxetine (10mg/kg b wt.) + TST

Experiment design: A box having each wall side with 35cm was used for the tail suspension test. The front surface of the apparatus was open and each mouse was suspended by fixing the tail in the centre of the upper surface using a tail hanger and non-irritant adhesive tape with the head 5 cm to the bottom. The experiment was performed in darkened room with minimal background noise for duration of 5 min. The total duration of immobility (total immobility time) was observed and measured during the final4mininterval ofthetestperiod. Alltestsessionswererecordedbyavideocamera positioned directly above the box. Mice were considered immobile only when they hung passively and completely motionless[41-42].

Table 7: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on body weight in mice (FST groups)

Body weight (g) during different treatment period							
Days	**Groups**						
	Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**	**Group 6**	**Group 7**
1	107.8±2.1	106.6±1.5	109.2±2.1	110.5±2.1	108.5±3.6	106.4±1.4	104.3±1.4
3	108.4±1.2	108.8±1.7	111.6±2.5	116.2±1.1	110.5±2.6	107.9±2.1	106.1±1.6
7	110.6±21	111.4±3.2	113.4±3.4	117.4±2.4	111.4±3.8	110.2±2.1	107.5±1.6
14	111.5±1.9	115.4±2.1	116.1±3.3	119.5±3.6	113.3±3.3	111.7±2.1	109.7±2.2
21	114.3±2.1	118.9±2.3	122.8±1.9	121.4±2.1	113.8±2.1	112.8±1.3	112.4±1.2

Values are presented as the mean ± SD (n=8). There were no significant differences at p<0.05.

Table 8: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on body weight in mice (TST groups)

Body weight (g) during different treatment period							
Days	Groups						
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
1	106.1±2.2	102.1±11	104.1±1.3	108.1±1.1	104.1±2.6	101.1±1.1	101.3±2.1
3	107.7±1.7	102.8±3.1	106.4±4.2	109.1±2.1	105.2±1.6	101.9±1.5	102.2±1.3
7	109.6±11	104.1±2.2	107.3±1.4	111.1±1.4	106.1±1.3	104.1±1.7	103.1±1.1
14	110.1±1.2	105.3±4.1	107.9±2.3	112.2±2.6	108.7±1.2	104.9±2.2	104.2±1.2
21	112.5±2.3	108.2±3.1	108.2±2.9	114.1±1.5	110.2±1.8	105.8±2.1	105.1±1.1

Values are presented as the mean ± SD (n=8). There were no significant differences at p<0.05.

Table 9: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on immobilitytime in the mice (FST groups)

Group	Dose mg/ kg b.wt	Duration of immobility (s)				
		Days				
		1	3	7	14	21
Group 1	-	-	-	-	-	-
Group 2	-	110.1±10.1	100.1±9.1	105.1±8.3	101.4±8.1	102.4±6.9
Group 3	75	100.4±6.6	84.1±5.6[a]	87.1±5.6	71.4± 7.1[a]	63.2±4.6[a]
Group 4	150	94.2±10.3	81.5±3.3[a]	72.2±5.3[a]	57.7±5.1[a]	54.4±5.7[a]
Group 5	300	84.3±8.1[a]	71.1±4.1[b]	61.1±4.7[b]	39.8±6.1[b]	20.2±6.6[b]
Group 6	10	70.1±7.2[b]	62.3±9.1[c]	52.2±6.1[c]	27.2±8.4[b]	12.4±3.9[c]
Group 7	10	78.4±10.2[a]	64.6±4.1[b]	61.1±3.1[b]	34.0±5.6[c]	21.5±5.2[b]

Values are presented as the mean ± SD (n=8). Values bearing different superscripts in the same columnare significantly different (p<0.05) (ANOVA).

Table 10: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on immobilitytime in the mice (TST groups)

Group	Dose mg/ kg b.wt	Duration of immobility (s)				
		Days				
		1	3	7	14	21
Group 1						
Group 2	-	91.3±4.9	90.7±10.1	91.4±6.3	89.4±7.7	88.1±7.7
Group 3	75	85.5±3.6	87.6±8.8[a]	81.4±6.3	77.7±4.7[a]	71.2±1.7[a]
Group 4	150	84.1±5.1	79.8±7.6[a]	73.7±4.2	70.6±3.6[a]	68.6±2.6[a]
Group 5	300	83.6±4.4	69.4±8.1[b]	64.1±4.4[a]	61.8± 6.7[b]	58.2± 3.7[b]
Group 6	10	78.5±4.1	62.7±10.4[b]	58.7±5.1[a]	52.4±4.4[b]	49.4±2.4[b]
Group 7	10	72.8±6.6	64.0±6.6[b]	53.4±4.6[a]	47.5±4.7[b]	43.5±5.7[b]

Values are presented as the mean ± SD (n=8). Values bearing different superscripts in the same columnare significantly different (p<0.05) (ANOVA).

ISSN: 0976-7126
Shah *et al.*, 12(10):31-41, 2021

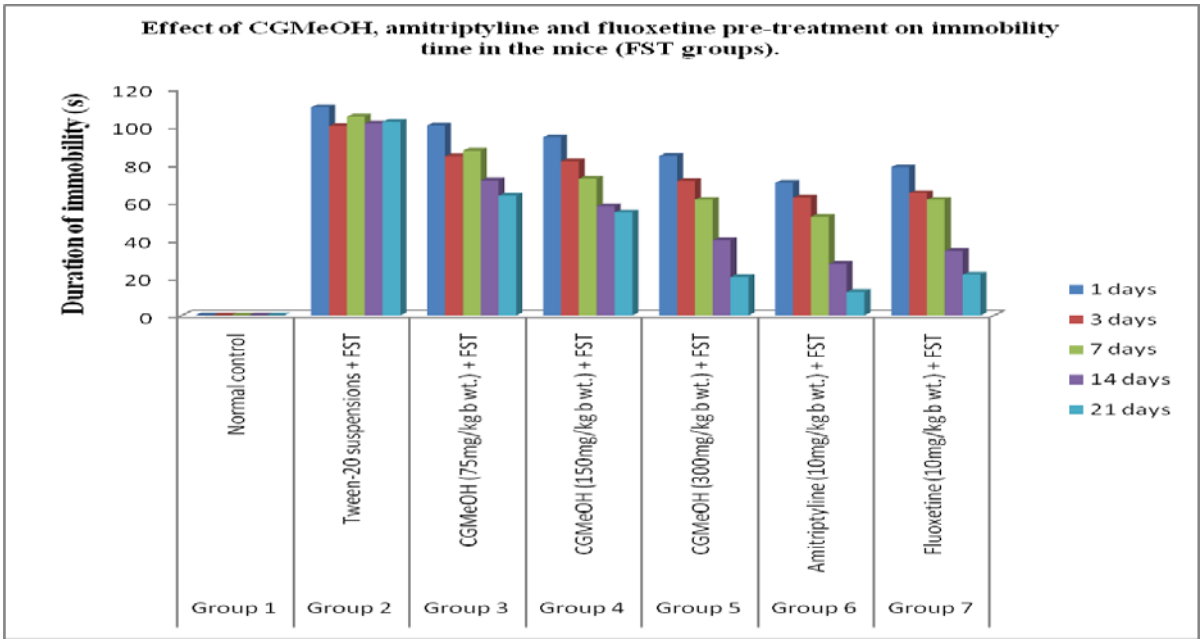

Figure 2: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on immobilitytime in the mice (FST groups)

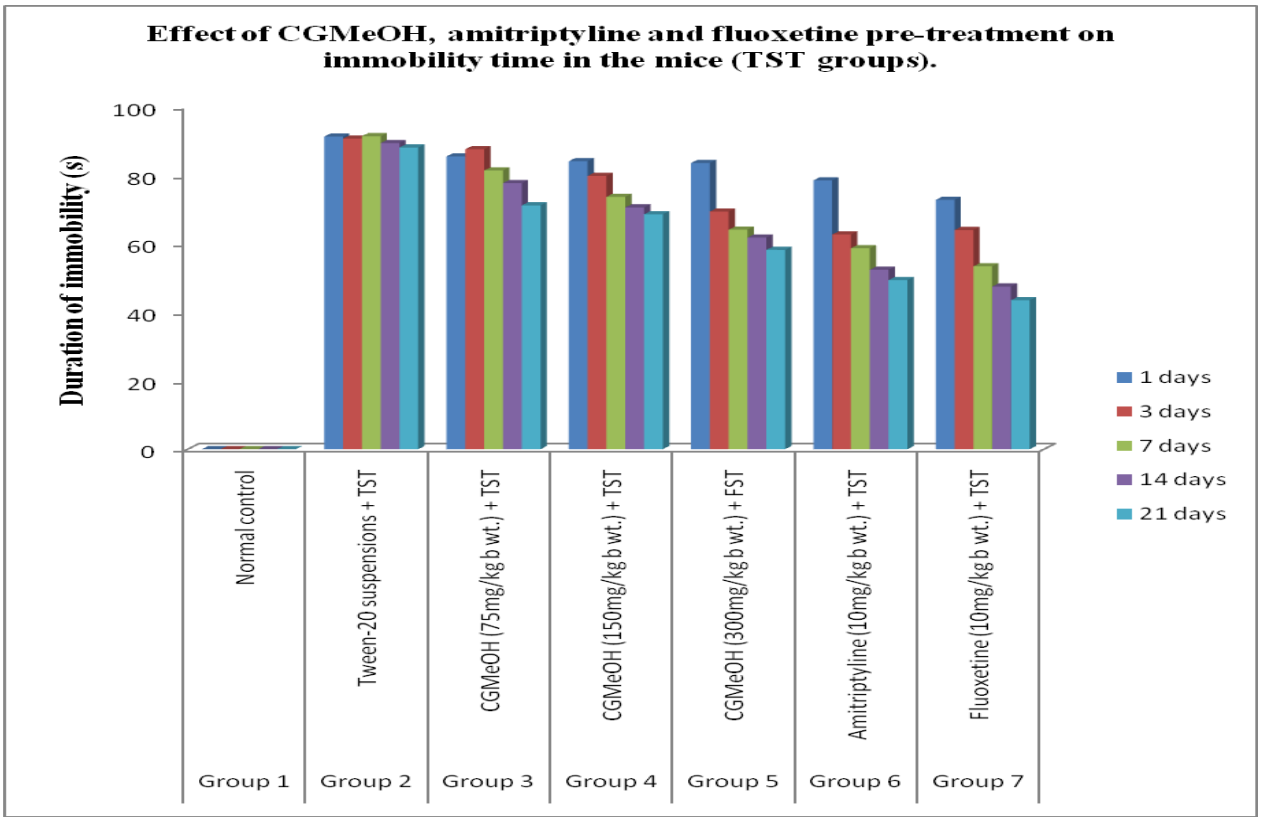

Figure 3: Effect of CGMeOH, amitriptyline and fluoxetine pre-treatment on immobilitytime in the mice (TST groups)

Results and Discussion

The selected plant material ***Cassia Grandis*** leaves were purchased from local market of Bhopal, (M. P.) India, and authenticated by botanist, dept. of botany, Barkatullah University, Bhopal. Voucher specimens are submitted to botany department, Barkatullah University, Bhopal. (M.P.). A systematic approach is necessary in pharmacognostic study, which helps in confirmation and determination of identity, purity and quality of a crude drug. The selected crude drugs were subjected to studies organoleptic characters viz., color, odour, appearance, taste, texture etc. *Cassia Grandis* leaves occur as compound leaves and having size 30 cm x 10 cm, paripinnated and alternate with 8-20 pairs of leaflets. The leaflets have size 6 x 1.5 cm, narrow and elliptical, downy beneath, green above and are pink when young. The results of organoleptic studies are presented in **Table 1** and **Figure 1.**Physicochemical parameter such as Ash values (Total ash, Acid insoluble ash and Water soluble ash), Extractive values, Loss on drying and pH of all selected plant drugs were performed. Ash values of crude drug provide an idea about the inorganic composition or earthy matter and other impurities present in drug. All parameters of selected drugs found within the limit as per API. Results of physicochemical parameters are shown in **Table 2.**The extractive values are mainly useful for the determination of adulterated or exhausted drug. Alcohol soluble extractive value of *Cassia Grandis* leaves were found 10.62 % w/w whereas Water soluble extractive value were found 12.4 % w/w. Results of extractive values are shown in **Table 3.**Methanol extract of *Cassia Grandis* leaves drugs obtained by maceration method after defatting of leaves with hexane. Defatting of leaves with nonpolar solvent cause removal of chlorophyll and fatty material which can further hindered the activity of plant extract.Extract (methanol extract) of selected plant *Cassia Grandis* leaves drugs obtained by maceration method was subjected to qualitative phytochemical tests to identify the presence of secondary metabolite (viz., alkaloids, glycosides, tannins, flavonoids, sterols, fats, oils, phenols and saponins) present in them. Preliminary phytochemical screening of methanol extract of *Cassia Grandis* leaves exhibited the presence of carbohydrate, tannin flavanoid, glycoside and saponin in methanol extract. Results are presented in **Table 4.**

The effect of extract on the body weight change is presented in **Table 7 and8**. All the result was showed that there was no difference in body weight gain by the animals among all the groups subjected to 1-day, 3-days and 7-days treatment. As the treatment began from 7 days to two to three week or 14 days to 21 dyas, a slight increase in weight gain was observed after oral administration. The weight gain of mice may be the normal weight gain of rats. It is confirmed that, administration of CGMeOH did not have any effect on the weight ofanimals. In FST, mice are forced to swim in a restricted space from which they cannot escape and are induced to a characteristic behavior of immobility. This behavior, reflecting a state of despair is reduced by several agents; these are therapeutically effectiveinhumandepression.TheTSTalsoinduce sastateofdespairinanimalslike thatinFST.Thisimmobility,referredtoasbehavior aldespairinanimalsand also recognized asaconditionsimilartohumandepression, this was investigated by possible time-dependent effects on immobility time. The oraltreatmentswithCGMeOHfor1, 3,7,14and21consecutivedaysrespectively were investigated under the standardized application schedule preceded by the appropriate vehicle controlapplication. A reduction in the duration of immobility of animals in the FST reflects their anti-depressant-likeperformance.CGMeOHadministrationshowe dasignificantactivityto reducetheimmobilitytimeatdosesof75,150and30 0mg/kginforcedswimmingtest in dose dependent manner in mice. The effects of CGMeOH, amitriptyline and fluoxetine on immobility in mice FST are presented in **Table 9**and **Figure 2**and TST are presented in**Table 10**and **Figure 3** respectively.The clinical anti-depressant effects often appear after chronic treatment, in mice in FST and TST.. The result indicated thatthe slight decrease in immobility time showed after 3rddays and 7thdays treatment and the decrease was non-significant at $p<0.05$. The mice were able to swimming after CGMeoH pre-treatment for14thdaysand21stdays.

Therewasareductioninthedurationofimmobilityst arted compared withstresscontrolandtheeffectwasobservedwitht heclassicalanti-depressantdrug fluoxetine andamitriptyline.
CGMeOHat300mg/kgb.wt.exhibitedsignificant decreaseinimmobilityduration after oral treatment for 14-days. After 21-days treatment of CGMeOH, there was a significant treatment effect for dose in immobility time. The maximal effect was observed at 300mg/kg b.wt. allowed to reduction in immobility time with reference as anti-depressants drug as amitriptyline andfluoxetine.

Conclusion

Mental depression is biological and emotional components are also attach with symptoms of depression include mystery, apathy and pessimism, low self- esteem consisting of feeling of guilt, inadequacy and ugliness, indecisiveness and loss of motivation. Patients with major depression have symptoms that reflect changes in brain, monoamine neurotransmitters, specifically nor epinephrine, serotonin, dopamine. Several drug-drug interactions can also occur. These conditions create an opportunity of alternative treatment for depression by the use of medicinal plants. Since all the synthetic drugs available for the treatment of depression have various adverse effects associated with problematic interactions, our aim is to explore the potential of medicinal plants in the management of depression. The present study is proposed cassia grandis leaves have more potent activity for management of depression due to presence of more phytochemical constituents have maximum potent phyochemical constituent for justified the proposed work. The treatment of CGMeOH with effective dose to 150 mg to 300 mg, there was a produce significant effect for dose in immobility time of all animals present in different grouops. The maximal effect was observed at 300mg/kg b.wt. allowed to reduction in immobility time with reference as anti-depressants drug as amitriptyline and fluoxetine. So, it was concluded that the methanolic extract of *Cassia grandis*Linn. leaves was able to treat depression produce in mice and as well as in human with effective concentration justified in present study.

References

1. Galderisi S, Heinz A, Kastrup M, Beezhold J, Sartorius N,"Toward a new definition of mental health." World psychiatry : Official journal of the world psychiatric association (WPA), 2015, 14, 2, 231–233.
2. Patel V, Kleinman A. "Poverty and common mental disorders in developing countries." Bulletin of the World Health Organization, 2003 81, 609-615.
3. Taube-Schiff M, Lau MA. In Major depressive disorder. Hersen, M.– Rosqvist, J.(szerk.) Handbook of psychological assessment, case conceptualization, and treatment, 2008, 1,319-351.
4. Addis ME, Jacobson NS, "Reasons for depression and the process and outcome of cognitive–behavioral psychotherapies." Journal of consulting and clinical psychology, 1996, 64, 6, 1417.
5. McKeon P, Carrick S. "Public attitudes to depression: A national survey. Irish journal of psychological medicine." 1991, 8, 2, 116-121.
6. Matschinger H, Angermeyer MC. "Lay beliefs about the causes of mental disorders: a new methodological approach." Social psychiatry and psychiatric epidemiology, 1996, 31, 6, 309-315.
7. Jorm AF,"Mental health literacy: Public knowledge and beliefs about mental disorders." The British Journal of Psychiatry, 1990, 177, 5, 396-401.
8. Jorm AF, Korten AE, Jacomb PA, Christensen H, Rodgers B, Pollitt P, "Public beliefs about causes and risk factors for depression and schizophrenia." Social Psychiatry and Psychiatric Epidemiology, 1997, 32, 3, 143-148.
9. Razali SM, Khan UA, Hasanah CI, "Belief in supernatural causes of mental illness among Malay patients: impact on treatment."Actapsychiatricascandinavica, 1996, 94, 4, 229-233.
10. Angermeyer MC, Matschinger H, Riedel-Heller SG,"Whom to ask for help in case of a mental disorder? Preferences of the lay public." Social psychiatry and psychiatric epidemiology, 1999, 34, 4, 202-210.

11. American Psychiatrie Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: American Psychiatric Association; 1994.
12. Angst J, "Depression and anxiety: implications for nosology, course, and treatment",J Clin Psychiatry. 1997, 58, 8, 3-5.
13. Kendler KS, Thornton LM, Prescott CA, "Gender differences in the rates of exposure to stressful life events and sensitivity to their depressogenic effects", Am J Psychiatry. 2001,158, 4, 587-93.
14. Kendler KS, Gardner CO, Neale MC, Prescott CA, "Genetic risk factors for major depression in men and women: similar or different heritabilities and same or partly distinct genes?"Psychol Med. 2001, 31, 4, 605-16.
15. Kandel ER, Squire LR, "Neuroscience: breaking down scientific barriers to the study of brain and mind", Science. 2000,290, 549, 1113-20.
16. Kuhar MJ, Couceyro PR, Lambert PD, Catecholamines. In: Siegel GJ, Agranoff BW, Albers L, Fisher SK, Uhler MD, Eds. Basic Neurochemistry Philadelphia, Pa: Lippincott Williams & Wilkins. 2001, 243–262.
17. Stahl SM,"Basic psychopharmacology of antidepressants, part 1: Antidepressants have seven distinct mechanisms of action", J Clin Psychiatry. 1998, 59, 4, 5-14.
18. Agranoff BW, Cotman CW, Uhler MD,"Learning and memory. In: Siegel GJ, Agranoff BW, Albers RW, Fisher SK, Uhler MD, Eds. Basic Neurochemistry. Philadelphia, Pa: Lippincott Williams & Wilkins. 1998,1027–1052.
19. Feighner JP,"Mechanism of action of antidepressant medications",J Clin Psychiatry. 1999, 60, 4, 4-11.
20. Rubin RT, Poland RE, Lesser IM, Martin DJ, "Neuroendocrine aspects of primary endogenous depression. V. Serum prolactin measures in patients and matched control subjects."Biol Psychiatry. 1989, 25, 1, 4-21.
21. Wong ML, Licinio J, "Research and treatment approaches to depression". Nat Rev Neurosci. 2001, 2, 5, 343-51.
22. Delgado PL, Moreno FA, "Role of norepinephrine in depression", J Clin Psychiatry. 2000, 61, 1, 5-12.
23. Narayan M, Bremner JD, Kumar A, "Neuroanatomic substrates of late-life mental disorders", J Geriatr Psychiatry Neurol. 1999, 12, 3, 95-106.
24. Brigitta B,"Pathophysiology of depression and mechanisms of treatment", Dialogues in clinical neuroscience, 2002, 4, 1, 7–20.
25. Elnaz VM, VahidMaleki, Maryam Behrooz, FatemehRanjbar, MehrangizEbrahimi-Mameghani, "Can psychobiotics "mood" ify gut? An update systematic review of randomized controlled trials in healthy and clinical subjects, on anti-depressant effects of probiotics, prebiotics, and synbiotics", Clinical Nutrition, 2020, 39, 5, 1395-1410,
26. Ganaie MUD, Behl T, Nijhawan P, Sachdeva M, Khan N, "Investigation of anti-depressant effect of aqueous and ethanolic extract of Cydonia oblonga in rats," Obesity Medicine, 2020, 18, 100202,
27. Fidelis EM, Savall AN, Luz Abreu E, Carvalho F, Teixeira F, Haas S, Sampaio T, Pinton S, "Curcumin-Loaded Nanocapsules Reverses the Depressant-Like Behavior and Oxidative Stress Induced by β-Amyloid in Mice," Neuroscience, 2019, 423, 122-130,
28. Al-Harrasi A, Csuk R, Khan A, Hussain J, "Distribution of the anti-inflammatory and anti-depressant compounds: Incensole and incensole acetate in genus Boswellia,"Phytochemistry, 2019, 161, 28-40,
29. Martins J, Brijesh S, "Phytochemistry and pharmacology of anti-depressant medicinal plants: A review," Biomedicine & Pharmacotherapy, 2018, 104, 343-365,
30. Islam A, Hussain S, Sen N, Abedin F, Millat S, Islam S, "Investigation of in vitro thrombolytic and anti-helminthic activity and in vivo anxiolytic and antidepressant potentiality with phytochemical nature of methanolic extract of Leucaslavandulifolia," Sustainable Chemistry and Pharmacy, 2017, 6, 61-66,

31. Chen WC, Lai YS, Lin SH, Kuan-Hung Lu, Yu-En Lin, SuraphanPanyod, Chi-Tang Ho, Lee-Yan Sheen, "Anti-depressant effects of Gastrodiaelata Blume and its compounds gastrodin and 4-hydroxybenzyl alcohol, via the monoaminergic system and neuronal cytoskeletal remodeling," Journal of Ethnopharmacology, 2016, 182, 190-199,
32. Ferlemi AV, Katsikoudi A, Kontogianni VG, Kellici TF, Iatrou G, Lamari FG, Tzakos AG, Margarity M, "Rosemary tea consumption results to anxiolytic- and anti-depressant-like behavior of adult male mice and inhibits all cerebral area and liver cholinesterase activity; phytochemical investigation and in silico studies," Chemico-Biological Interactions, 2015, 237, 47-57, 0009-2797,
33. Goyal M, Sasmal D, "CNS depressant and anticonvulsant activities of the alcoholic extract of leaves of Ziziyphusnummularia," Journal of Ethnopharmacology, 2014, 151, 1, 536-542,
34. Sasaki K, Abdelfatteh El Omri, Shinji Kondo, Junkyu Han, Hiroko Isoda, "Rosmarinusofficinalis polyphenols produce anti-depressant like effect through monoaminergic and cholinergic functions modulation,"Behavioural Brain Research, 2013, 238, 86-94,
35. Hussain J, Rehman NU, Hussain H, Ahmed Al-Harrasi, Ali L, Rizvi TS, MehjabeenM, "Analgesic, anti-inflammatory, and CNS depressant activities of new constituents of Nepetaclarkei,"Fitoterapia,2012, 83, 3, 593-598,
36. Rezvani ME, Roohbakhsh A, Mosaddegh H, Esmailidehaj M, Khaloobagheri F, Esmaeili H, "Anticonvulsant and depressant effects of aqueous extracts of Carumcopticum seeds in male rats," Epilepsy & Behavior,2011, 22, 2, 220-225,
37. Hou Y, Aboukhatwa MA, Lei D, Manaye K, Khan I, Luo Y, "Anti-depressant natural flavonols modulate BDNF and beta amyloid in neurons and hippocampus of double TgAD mice," Neuropharmacology, 2010, 58, 6, 911-920,
38. Zhang M, Wei Jin, Zhou X, Yu J, Lee AJ, Sun S, "Deregulation of Tpl2 and NF-κB signaling and induction of macrophage apoptosis by the anti-depressant drug lithium," Cellular Signalling, 2009, 21, 4, 559-566.
39. Slattery, D., Cryan, J,"Using the rat forced swim test to assess antidepressant-like activity in rodent",. Nat Protoc 7, 2012 1009–1014.
40. CastagnéV, Moser P, Roux S, Porsolt RD, "Rodent models of depression: forced swim and tail suspension behavioral despair tests in rats and mice",CurrProtocPharmacol. 2010, 5, 5, 8.
41. Steru L,Chermat R, Thierry B, Simon P, "The tail suspension test: a new method for screening antidepressants in mice",Psychopharmacology (Berl). 1985, 85, 3, 367-70.
42. Pan H, Dohn M R., Kingston R, Carneiro AMD, "Integrin αVβ3 Function Influences Citalopram Immobility Behavior in the Tail Suspension Test", Frontiers in Neuroscience, 2019, 13, 70.

Cite this article as:
Shah R., Prajapati M., Mohanty P.K. and Rai J.P. (2021). Pharmacological Screening of *Cassia grandis* Leaves for Antidepressant Activity. *Int. J. of Pharm. & Life Sci.*, 12(10):31-41.

Source of Support: Nil
Conflict of Interest: Not declared
For reprints contact: ijplsjournal@gmail.com