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Mini Review

Scientific Studies on Momordica Charantia L.

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Introduction

Momordica charantia L., commonly known as Bitter Melon or Bitter Gourd (Carilla fruit) belongs to the family Cucurbitaceae. A monoecious plant cultivated thought India up to an altitude of 1,500 m Figure [1]. The roots are bitter, acrid, astringent and ophthalmic, and are useful in colpoptosis and ophthalmopathy. The leaves are bitter, anthelmintic, antipyretic, emetic, and purgative. Helminthiasisul in vitiating conditions of pitta, helminthiasis, constipation, intermittent fever, burning sensation of the sole and nyctalopia. The fruits are bitter, acrid, thermogenic, depurative, vulnerary, stimulant, purgative, appetizing, antidiabetic, carminative, digestive, stomachic, anthekmintic, anti-inflammatory, emmenagogue, febrifuge and tonic. They are useful in vitiated conditions of kapha and pitta, skin diseases, leprosy, ulcer, wounds, burning sensation, constipation, anorexia, flatulence, colic, helminthiasis, eheumatalgia, gout, diabetes, hepatomegaly, splenomegaly, haemorrhoids, inflammatin, asthma, cough, dysmenorrhoea, impurity of breast milk, fever and debility. Seeds are useful in the treatment of ulcers, pharyngodynia and obstructions of the liver and spleen. The leaves and fruits are used for external application in lumbago, ulceration and bone fractures and internally in leprosy, haemorrhoids and jaundice. A lot of studies have already been carried out with special reference to antidiabetic activity. The present paper deals with pharmacognostic, phytochemical, pharmacological and toxicological studies on the root, leaves and fruits of Momordia charantia.

Figure 1: Momordica charantia.

Pharmacognosy & Phytochemistry:

Plant Material of Interest : Root, leaves and fruits (whole plant)

General Appearance : Leaf blade, 5+12 cm long and broad, renifarm or suborbicular, fruits muricate, tuberculate, oblong.

Organoleptic Properties : Free flowing powder is green in colour having a characteristic odour and bitter taste.

Microscopic characteristics : NA

Powdered plant material : NA

General identity test : Characteristic chromatographic finger printing.

Chemical:

Foreign organic matter : NA

Total ash : NMT 5%

Acid insoluble ash : NA

Water soluble extractive : NA

Alcohol soluble extractive : NA

Loss on drying : NA

Swelling index : NA

Pesticide residues : DNA

Heavy metals : Arsenic NMT 1 ppm, Lead NMT 5ppm

Radioactive residues: : NA

Other purity tests: : NA

Chemical assay : Assay of active principle by HPTLC/ HPLC, NLT 30% w/w

Major Chemical Constituents: 5≈-stigmasta-7, 25-dein-3-·-ol. Charautin, Momordicin, Momordicoside-I, cryptoxanthin, Elasterol, Flavochromone, Pectin (1) Table [1,2,3].

Table 1: Effect of Momordica charantia (Aqueous extract) on BP and HR of normotensive anaesthetized Wistar Rats.

Groups		Initial	5 min	30 min	60 min	90 min	120 min	150 min	180 min	Death
Control		100	101.2 ± 8.8	95 ± 15.6	93.7 ± 16.5	98.6 ± 23.5	96.1 ± 18.9	86.5 ± 13.9	82.5 ± 19.2	0
Momordica spp. 1g/kg, i.g.	P	100	108.7 ± 8.7	96.8 ± 11.4	104 ± 12.0	100.4 ± 13.2	97.4 ± 19.1	95.6 ± 12.8	86.7 ± 12.7	0
			0.16	0.82	0.25	0.87	0.91	0.27	0.66	

% Change of Systolic blood pressure (mean ± SD n=6)

Table 2: % Change of Diastolic blood pressure (mean ± SD, n=6).

Groups		Initial	5 min	30 min	60 min	90 min	120 min	150 min	180 min	Death
Control		100	102. ± 15.0	92.2 ± 21.7	86.3 ± 28.3	97.2 ± 34.4	92.5 ± 29.8	81.3 ± 16.1	79.7 ± 21.1	0
Momordica spp. 1g/kg, i.g.	P	100	116.5 ± 20.1	94.3 ± 17.6	109.1±36.1	106.3 ± 42.3	101.8 ± 42.1	99.6 ± 35.5	86.3 ± 23.6	0
			0.21	0.86	0.25	0.69	0.68	0.28	0.62	

Table 3: % Change of Heart rate (mean ± SD, n=6)

Groups		Initial	5 min	30 min	60 min	90 min	120 min	150 min	180 min	Death
Control		100	100±0	99.6±3.4	99.2 ± 1.9	98.5 ± 3.7	97.6 ± 5.2	98.7 ± 7.3	97.8 ± 5.7	0
Momordica spp. 1g/kg, i.g.	P	100	98.9±2.7	102.3±9.1	108.7 ± 5.2	116.5 ± 14.0	117.5 ± 12.7	116.3 ± 13	116.3 ± 9.5	0
			0.34	0.5	0.002	0.013	0.005	0.016	0.002	

Extract : Momordica water extrac

Animal : Wistar rats, both males and females

Protocol : the rats were anesthetized with Urethane at 1.2g/kg, ip; carotid canulationn Table [4].

Table 4: Effect of Momordica charantia (Aqueous extract) on glucose level in hyperglycemiac normal mice.

roup	Dose, p.o.,	Blood glucose level (mg/dl) (Mean± SD)		
		Initial blood glucose	After Treatment	Difference
Control	-	126.9 ± 16.4	276.6 ± 28.9	149.7 ± 28
Momordica	1.0 g/kg	112.8 ± 23.9	316.1 ± 34.1	203.3 ± 36.7
Momordica	2.0 g/kg	121.0 ± 25.6	265.7 ± 50.8	144.1 ± 54.1
Glibenclamide	25.0 mg/kg	135.5 ± 26.5	166.4 ± 63.8 **	30.9 ± 66.1 **
** compared with the data of control, P<0.01				

Difference : between the 'initial blood glucose' and the 'blood glucose after treatment'

Extract : water extract of Momordica charantia,

Animals : male T/O mice, body weight 18-25g.

Protocol : mice were divided into four groups and fasted for 12 hours. Momordica spp. (1g/kg and 2g/kg) and glibenclamide (25mg/kg) were administered to treated groups and water to control group. Ninety minutes later, glucose solution was given orally at 2g/kg. Blood was collected from retro-orbital plexus before the drug administration and 30 minutes after the glucose loading Table [5].

Table 5: Effect of Momordica charantia (Aqueous extract) on blood glucose level in STZ -induced diabetic mice.

Groups	Dose, p.o.	Blood glucose level (mg/dl) (Mean ±SD)		
		Initial blood glucose	After treatment	Difference
Control	-	166.5 ± 33.6	213.4 ± 73.1	46.954.7
Momordica charentia	1.0 g/kg	167.6 ± 37.1	226.1 ± 89.7	56.562.2
Momordica cahrentia	2.0g/kg	168.3 ± 48.0	203.1 ± 53.4	34.747.6
Glibenclamide	25.00 mg/kg	170.0 ± 31.6	126.0 ± 82.4 *	-44.061.6 **
Compared with the data of control, *P<0.05; **P<0.01				

Difference: between the 'Initial Blood Glucose' and the 'Blood Glucose After Treatment'

Extract: water extract of *Momordica charantia*,

Animals: T/O mice, both males and females. STZ was injected (100mg/kg, ip) 12 days ago to cause diabetes.

Protocol: the diabetic mice were divided Fasting time was 4 hours. Fasting blood glucose was tested 3 hours after the drugs' administration.

There were no significant toxicological symptoms at the dose tested. The data suggest that the hypoglycemic properties of bitter melon (Momordica charantia, Linn. Family, Cucurbitaceae), are at least partially due to their sulfonylurea-like activity.

The Acute Toxicity of Momordica charantia on Mice

Table 6: The effects of Momordica charantia (10g/kg, p.o) on hematology and body weight in mice (X±SE, n=10)

		Control Group	Momordica charantia	Momordica charantia
Dosage& Routine		0.4ml.10g-1, p.o once	5.0 g.kg-1, p.o once	10.0 g.kg-1, p.o once
Chang of BW (g)	Initial	28.35± 1.07	27.56± 1.62	27.57± 1.39
	7 days later	28.27± 1.37	27.70± 1.63	27.68± 1.34
	Diff.	-0.06± 0.60	0.15± 0.27	0.45± 0.48
2 hrs after dosing	WBC (103/mm^3)			
	RBC (106/mm^3)	9.94± 0.16	9.66± 0.12	9.14± 0.29*
	HGB (g/dl)	12.49± 0.23	13.86± 0.12	12.31± 0.33
	HCT (%)	49.46± 0.86	49.84± 0.60	45.79± 1.34*
	MCV (um^3)	50.18± 0.48	51.30± 0.57	50.20± 0.73
	MCH (pg)	13.98± 0.15	14.35± 0.19	13.49± 0.26
	MCHC (g/dl)	27.92± 0.15	27.89± 0.12	26.89± 0.22**
	PLT (103/mm^3)	277.00±27.77	237.40±20.22	354.80±94.49
3 days after dosing	WBC (103/mm^3)			
	RBC (106/mm^3)	10.02± 0.10	9.56± 0.18	9.27± 0.31*
	HGB (g/dl)	13.93± 0.10	13.91± 0.16	13.05± 0.43*
	HCT (%)	50.49± 0.34	48.84± 0.68	46.68± 1.56*
	MCV (um^3)	50.30± 0.34	51.00± 0.65	50.30± 0.68
	MCH (pg)	13.93± 0.13	14.56± 0.19*	14.07± 0.21
	MCHC (g/dl)	27.65± 0.11	28.48± 0.11**	27.96± 0.11
	PLT (103/mm^3)	356.50±86.75	205.90±41.25	425.30±107.60

The Acute Toxicity of Momordica charantia on Mice

Table 7: The effects of Momordica charantia extract (10g/kg, p.o) on hematology and body weight in mice (X±SE, n=10)

		Control Group	Momordica charantia	Momordica charantia
Dosage& Routine		**0.4ml.10g-1, p.o once**	**5.0 g.kg-1, p.o once**	**10.0 g.kg-1, p.o once**
7 days after dosing	WBC (103/mm^3)			
	RBC (106/mm^3)	9.54± 0.16	9.64± 0.25	9.50± 0.18
	HGB (g/dl)	13.34± 0.39	13.73± 0.38	13.30± 0.22
	HCT (%)	48.09± 1.25	49.38± 1.37	47.98± 0.72
	MCV (um^3)	50.40± 0.60	51.20± 0.49	50.50± 0.52
	MCH (pg)	13.96± 0.23	14.25± 0.17	14.00± 0.13
	MCHC (g/dl)	27.71± 0.16	27.77± 0.19	27.78± 0.18
	PLT (103/mm^3)	322.50±61.94	195.40±13.45	378.50±104.40
*P<0.05, **P<0.01 vs control group.				

Animals: MF mice, both of male and female were used.

Extracts: Momordica charantia (water-extract was dissolved in dilution water before they were used.

Dosage and Routine: Momordica charantia) 5.0-10 g.kg-1was given orally, control group was treated with equal volume dilution water (0.4 ml.10g-1).

Signs and symptoms of observation: 30 minutes after extracts was given orally, the signs and symptoms of animal behavior was checked, such as loco motor activity, aggressive behavior, diarrhea, ataxia, string, platform and pole test, lasted to 4 hrs and then 7 days. The changes of body weight in each group were checked and compared. Hematology was checked 2 hrs, 3 days and 7 days after extract was given with Animal Blood Counter.

Results: The change of body weight and result of hematology is as follows (Table):

Conclusion: 20% of mice showed slight weakness in platform and pole test 1 hr after 10 g.kg-1 of MT combination was given. But it recovered to normal 4 hrs after dosing. RBC and Hgb were also lower in this group 2 hrs after dosing and lasted 3 days. There are not any side effects when 5.0 g.kg-1 water-extracts of MT combination was given orally; the LD50 of Momordica charantia is more than 10 g.kg-1 (p.o).

The Effects of Momordia charantia on Body Weight in Mice

Table 8: The effects of Momordia charantia (5.0g/kg, p.o) body weight in mice (X±SE)

		Control Group	Momordia charantia
Dosage& Routine		**0.3 ml.10g-1, p.o for 15 days**	**5.0 g.kg-1, p.o for 15 days**
Initial		27.88± 0.80	28.73± 1.05
1 Week	Reading	28.39± 1.05	29.29± 1.02
	% of initial value	101.68± 1.75	102.06± 0.62
2 Week	Reading	30.37± 0.99	30.77± 0.98
	% of initial value	108.79± 0.85	107.47± 1.13
n		19	18

Animals: T/O mice, both of male and female were used.

Extract: Momordica (water-extract, was dissolved in dilution water before they were used.

Dosage and Routine: Momordia charantia 5.0g.kg-1was given orally, control group was treated with equal volume dilution water (0.3 ml.10g-1), total is 15 days.

Signs and symptoms of observation: the signs and symptoms of animal behavior were checked every day, such as loco motor activity, aggressive behavior, diarrhea after extracts were given orally, for 10 days. The changes of body weight in each group were checked and compared in 1 and 2 weeks.

Results The change of body weight is as follows (Table):

Conclusion: There are not any effects to the behavioral activity, no effects to the change of body weight when 5.0 g.kg-1 water-extracts of Momordia charantia was given orally for 15 days Table [9].

Table 9: The effects of Momordica charantia on prothrombin time in mice in mice (Mean ± SE).

Groups	Dose & route	N	B.W (g)	Prothrombin Time (sec)
Control	0.4 ml/10g	5	29.53 ± 1.02	8.48 ± 0.31
MT Combination	5.0 g/kg	6	28.59 ± 0.96	9.06 ± 0.17
MT Combination	10.0 g/kg	4	29.17 ± 0.95	9.08 ± 0.18

Animals: T/O mice, both of male and female were used.

Extracts: Momordica (Aqueous extract),

Dose regime: 5.0 –10.0 g/kg of Momordica charantia

Protocol: 2 hrs after extracts was given orally, 9 vol. blood was collected in 1 vol. 3.2% trisodium citrate, blood sample was centrifuged for 10 min at 2,500 g. plasmas were collected for prothrombin time test with diagnostic stago instrument

Results: Momordica charantia (Aqueous extract) at the dose 5-10 g/kg administered orally, once, showed no effect to prothmobin time in mice.

The Effect of Momordica extract on locomotor activity in Mice

Table 10: The effects of Momordica extract (5.0g/kg, p.o) on locomotor activity in mice (TESTING TIME: 30 minutes; X±SE).

Group		n	DOSE / ROUTE	Total (No/30 min)	Ambulat ory (No/30 min)	Vertical (No/30 min)	Distance (cm/30 min)	Restimg. T (sec/30 min)	Ambl. Time (sec/30 min)	Sterotype time (sec)
1 Week	Control group	19	0.3ml.10g-1 p.ox7 days	5832.53±494.25	3282.00±309.35	237.50±26.04	5328.63±312.08	886.16 ± 36.36	189.16±11.45	724.80±27.2
	Mo-mordic aextract	18	5.0 g. Kg-1 p.o x7 days	5669.00±641.6	3246.20±437.39	222.50±34.74	5596.90±745.47	943.83 ± 63.84	187.10±22	669.33±45.64
2 Week	Control group	19	0.3ml.10g-1 p. ox14 days	5487.95±243.88	3108.26±183.25	311.60±53.73	5061.68±214.99	872.37 ± 24.25	180.26±8.99	747.40±18.25
	Mo-mordic aextract	18	5.0 g. Kg-1 p.o x14 days	5252.00±470.1	3226.10±341.63	296.86±47.48	514.70±325.4	933.44 ± 41.14	171.90±11.7	711.83±28.11

Animals: T/O mice, both of male and female were used.

Extracts: Momordica water-extract, was dissolved in dilution water before use.

Dosage and Routine: 5.0 g.kg-1 was given orally for 15 days.

Animal model: Locomotor activity (software with computer was supplied by Cloblous Co. USA)

Procedure: the locomotor activity (including total numbers, ambulatory numbers, vertical numbers, distance, resting time, ambulatory time, sterotype time) of mice in box was recorded in 30 minutes in 1 and 2 weeks.

Conclusion: there were no effects to locomotor activity in mice when 5.0 g.kg-1 of MT water extracts was given orally for 15 days.

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Conflict of Interest

None.

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