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EXPLORATION OF ALKALOIDS AS PLANT NATURAL PRODUCT FROM FLORA OF RAJASTHAN, INDIA: A REVIEW

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Plants are the biofactories. Indian Medicinal plants and their role in therapeutic usage was well documented by Charaka and Sushruta in 1500-500 BC. Medicinal Plants have been used in healthcare since long era. The vital role of medicinal plants in disease prevention and there promotions. Thus, in present review attempts were made to compile the data of Medicinal plants and their secondary metabolites for screening or bio-efficacy and/or isolation of bioactive especially with reference to alkaloids from Rajasthan. The study was conducted in region of Rajasthan, India. Rajasthan is situated in the north-western part of India between 23^3' and 30^12 N latitude and 69^30' and 78^17 E longitude and comprises an area of about 34239 Sq Km. Electronic literature review method was accustomed to study different review paper or research articles.The data was collected from Google, Google scolar ,Pubchem science direct and also from various type of Journal such as Journal of Asian natural product research , African Pacific Journal of infectious disease etc. from the year 1984-2019were taken under consideration. In this review article 30 plants were reviewed and study for the alkaloids and their efficiency as therapeutic agents was reported. In this research we found that 15 families and from these families approximate 210 alkaloids were found to be present. These plants possess various biological activities such as, anti-inflammation, anti-diabetic, anti-cancerous.Plants surviving in such harsh condition possess amount of alkaloids which provides medicinal properties to the mankind and also provide the defense mechanism to the plants. These alkaloids rich plants can be alternative source of diet and replace the nutraceuticals as therapeutic targets in future.

Keywords: Indian Medicinal Plants, Rajasthan, Natural Products, Alkaloids

Introduction

Plants play vital role in medicines. The importance of using medicinal plants is that they are affordable and mostly show positive result once they used as herbs[1]. Medicinal plants have contribution to the healthcare around the world[2].

These medicinal plant are very useful in drug development[3].Out of total 4,20,200 flowering plants reported from the world more than 50,000 areused as a medicinal purpose[4]. The traditional medicine is widespread in various countries like China, India, Japan , Pakistan , Sri lanka and Thailand[5]. Medicinal plants are mostly used as in non- industrialized society as they are readily available and less expensive than modernmedicines. They are also used for micronutrients deficiencies[6].

Plants possess secondary metabolites. The structure of secondary metabolites is just similar with hormones, endogenous substrates and due to which it mimic a responses to the corresponding molecular targets[7]. Alkaloid, Flavanoids, Phenols, Saponin, Tannin, are bioactive compounds in the plants which are essentials in plants

metabolic activity. Plant alkaloids, is one of the largest groups of natural products. Alkaloids mostly contain basic nitrogen atom. There are various classification for alkaloids but the most popular classification that divide whole alkaloid into three parts is first,True Alkaloid, these are those alkaloids which are derived from amino acid and a heterocyclic compound with nitrogen.Second, Protoalkaloids, these types of alkaloids which have nitrogen atom and they are derived from an amino acid . Third, Pseudo alkaloids, these alkaloids are those that do not originated from amino acid[8].

Alkaloids have a wide distribution in plants kingdom but most importantly they exists in higher plants such as those plants which belongs to the family Ranunculacea ,leguminosae,papaveraceae,menispermaceae, Loganiaceae[9]. There are more than 3000 alkaloids in over different 4000 plants species. Pure forms of alkaloids are colourless and odourless crystalline solids. They are bitter in taste. The first alkaloids was isolated in 1804 is Morphine from Opium Poppy in crystalline form. Some of the alkaloids include morphine, strychnine, quinine, atropine,caffeine, ephedrine and nicotine etc.

Pharmaceutical and medicinal uses of alkaloids

Alkaloids show medicinal property and some of the alkaloids possesanesthetic properties. Morphine is a powerful narcotic which is used as a pain relief. Atropine, which is an alkaloids used to treat bradycardia. Tubocirarine which is used in surgery as muscle relaxant. Quinine is an powerful antimalarial agent which is used to treat arrhythmias[10]. Most of the alkaloids have numerous biological activities such as antiflammatory, antimicrobial, antiulcer, muscle relaxant etc.[11].

Materials and Methods

Study area

Rajasthan, a state in India where hundred of medicinal plants are reported . Rajasthan is largest state in India. The states is situated in the north-western part of India between 23^3' and 30^12 N latitude and 69^30' and 78^17 E longitude and comprises an area of about 34239 Sq Km. Rajasthan comprises most of the thar desert and it shares a border with pakisthan provinces of Punjab. The geological feature of Rajasthan state is the Aravalli range which divides the state into two main physiographic regions, the 2/3 sandy arid plain which is unproductive, thar desert and 1/3 eastern fertile region rich in vegetation[12].

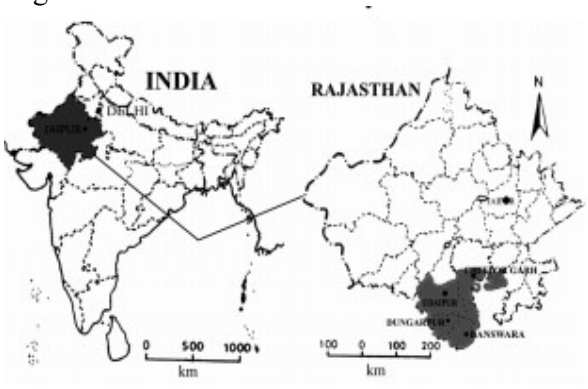

Fig. 1. Map of India and Rajasthan[13,14]

Data collection

This study aimed to spot secondary metabolites " Alkaloids" for the treatment of various kind of disease. Electronic literature review method was accustomed to study different review or research paper.The data was collected from Google, Google scolar, Pubchem, science direct and also from various type of Journal such as Journal of asian natural product research, and so on. Article publish from the year 1984-2019were used to write review paper. No limitation were given to data manuscripts. Search term include "Alkaloid", "Secondary metabolites", "Rajasthan", "Medicinal plant", "Uses of Alkaloid". Complete anaylasis was performed through the literature search of known species and also the associated molecule mechanism underlying the wound healing to that phytochemical. Medicinal plants were found to be effective for variousvariety of disease.

Table1. List of Medicinal Plants with common name, family, isolated alkaloids and uses

NO.	NAME	COMMON NAME	FAMILY	COMPOUND AND STRUCTURE	USES	PLANT PART	REFERENCE
1	*Abutilon indicum*	India Kanghi	Malvaceae	**1**.Aurantiamide acetate	antioxidant and anti-inflammatory efficacy	Whole plant	[15][16][17]
				2.(R)-N-(1'-Methoxycarbonyl-2'-phenylethyl)-4hydroxybenzamide	Anti-pain		[15][16]
				3.N-Feruloyl tyrosine	Treat phenylketonuria		
				4.Methyl indole-3-carboxylate	laxative and tonic, anti-inflammatory, anthelmintic		
				5.Vasicine	asthma, chronic bronchitis	Aerial part	
2	*Jatrophagos sypiifolia L.*	Ratanjoti	Euphorbiaceae	**1.**Ricinine	insecticidal effects	Leaves	[18][19]
				2.Cleomiscosin A	anti-inflammatory activity.	Stem	
				3.Piperidine	antitubercular, anti inflammatory, anti viral	Not specific	
				4.Imidazole alkaloid	Fungicides, antifungal, antiprotozoal, antihypertensive		
				5.Gadain	stomachache, skin inflammation, eye infection, chest pain and itching	Stem ,root, seed	[18] [20]
3	*Heliotropiu mindicum*	Indian Heliotrope	Boraginaceae	**1.**Heliotrine	hepatitis liver cirrhosis	Whole plant , Aerial Part, Seed	[21]

				2.Indicine-N-oxide	antineoplastic	Whole plant, Aerial part	
				3.Retronecine	chest troubles	Whole Plant	
				4.Echinatine	Anticancerous, esophageal cancer	Aerial part	
				5.Heleurine	analgesic (rheumatism), diuretic, skin problems	Aerial Part, Seed	
				6.Supinine	Anti-cancer	Aerial Part	
				7.Cynoglossine	insomnia	Seed	
				8.Heleotrine – N- oxide	hepatitis cirrhosis		
				9.Putrescine	epilepsy	Leaves	
				10. Spermidine	low blood pressure		
				11. Spermine	cellular metabolism		
4	*Fumaria indica*	Shahatra, Pitpapra	Fumariaceae	**1.**Papracinine	vomiting, constipation	Aerial Part	[22]&[23]
				2.Paprazine	worm infections.		[22]
				3.Parfumine	blood purification		
				4.Lastourvilline	Anti malarial		[22]&[23]
				5.Feruloyl tyramine	regulate blood pressure		
				6.Fumariflorine	Tooth decay		[23]&[24]
				7.N-methyl corydaldine	mild depression		
				8.Protopine	inhibit histamine H1 receptors and platelet aggregation	Whole plant, stem, leaves and seed	
				9.Fumariline	anti-pyretic, anti-bacterial,		

					anti-diabetic, anti-inflammatory, anti-diarrheal, anti-spasmodic, antihelmintic		
				10. Tetrahydrocoptisine	digestive disorders		
				11.adlumidine	Eczema, dermatologic	Not found	
				12.Oxy Sanguinarine	emetic, respiratory aid	Seed	
5	*Gloriosa superb Linn.*	Kaligari	Liliaceae	**1.**colchicine	gout attacks	Seed, tubers	[25]
				2.gloriosine	gout and rheumatism.		
				3.lumicolchicine	colchicine actions	Whole Plant	
				4. 3-demethyl-colchicine	antitumor activity	Seeds	
				5.Bechuanine	joint pain	Corms and Seed	[26]
				6.colchicamide	improves pain, movement of muscles		
				7.Isoperlolyrine	bruises, colic		
				8.N-formyl-N-deacetylcolchicine	joint pain		
				9.3-lumicolchicine	colchicine actions		
				10.Colchicoside.	muscle relaxant	Seed	
6	*Aerva lanata*	GorkhaBundi	Amarathaceae	**1.** Canthin-6-one	induces cell death, cell cycle arrest and differentiation in human myeloid leukemia cells	Herbs	[27]
				2.10-Hydroxycanthin-6-one	antineoplastic agent.		

				3. Beta-Carboline-1-propionic acid	inflammation		
7	*Bacopa monnieri*	Brahmi	Plantaginaceae	**1.**Brahmine	improving brain functions	Leaves	[29]
				2.Nicotine	Anti-smoking	Herbs	[28]
8	*Ziziphus nummularia*	Jari-bor	Rhamnaceae	**1.**Nummularine T	cold	Bark	[30]
				2.Nummularine S	mental retardation, dysentery, diarrhoea	Stem Bark	
				3.Mauritine D	ulcer	Root Bark, Stem Bark	
				4.Nummularine-P	mental retardation		
				5.frangufoline	sedative		
				6.amphibine H	hysteria		
				7.Nummularine K	influenza		
				8.Mauritine C	malaria		
				9.Nummularine G	hysteria		
				10. Nummularine H	wound recovering	Stem Bark	
				11. Nummularine F	pharyngitis	Root Bark . Stem Bark	
				12. Nummularine A	mental retardation		
				13. Integerrenine	blood pressure,		[31]
				14. Mauritine F	Used to treatment Coughing or hoarseness		
				15. Amphibine A	Colds, influenza		
				16. Mucronine A	sexually transmitted infections		
				17. Mauritine A	diabetes control		
9	*Ziziphus mauritiana*	Bor	Rhamnaceae	**1.**Mauritine C	malaria		[32]
				2.Mauritine D	ulcer		
				3.Mauritine F	Coughing		
				4.Mauritine A	diabetes		
				5.Mauritine B	improving muscular strength		
				6.Sativanine K	Liver, bladder	Root Bark	

					diseases		
				7.Mauritine J	pain		[33]
10	*Solanum indicum*	Nar-kanta	Solanaceae	**1.**Indicumine A	relieve pain, swelling, joint stiffness	Seed	[34]
				2.Indicumine B	cold, cough, sore throat		
				3.Indicumine C	Asthma		
				4.Indicumine D	antioxidant , anticancer		
				5.Cleosandrin	respiratory tract infections		
11	*Datura stramonium*	Dhatura	Solanaceae	**1.**Tropinone	biomimetic reaction, biogenetic-type synthesis		[36]
				2.Tropine	bradycardia	Seed and Root	[35]
				3.Pseudotropine	cuts		[36]
				4.Tropigline	muscle rigidity, Parkinson's disease		
				5.Methylecgonine	toothache		
				6. 3-Acetoxytropane	Digestive, urinary tract spastic	Seed	[35]
				7. 3-Acetoxy-6-hydroxytropane	ophthalmological eyedrops to enlarge pupils	Root	
				8. 3α-Tigloyloxytropane	ophthalmic examination	Root, Stem	
				9.Cuscohygrine	sedative, hypnotic laxative, diuretic	Root	
				10. Phenylacetoxytropane	analgesic, anthelmintic, anti-inflammatory	Root , Stem ,Flower Seed	
				11. 3-Tigloyloxy-6-propionyloxy-7-hydroxytropane	stomachache		
				12.Apohyoscya	peptic		

				mine	ulcer, irritable bowel syndrome		
				13. Aposcopolamine	Nausea, vomiting		
				14. Littorine	asthmatic symptoms		
				15. Hyoscyamine	intestinal disorders, peptic ulcer		
				16. 3,6-Ditigloyloxytropane	Digestive, urinary tract spastic	Root	
				17. 6-Hydroxyapohyoscyamine	bladder spasms, peptic ulcer disease, diverticulitis,	Root, Stem	
				18. Scopolamine	prevent nausea, vomiting	Root, Stem, Flower Seed, Leaves	
				19. 7-Hydroxyhyoscyamine	peptide ulcer		
				20. 6-Hydroxyhyoscyamie	gastrointestinal tract		
12	*Vernonia cinerea Less.*	Sandri	Asteraceae	**1.**Guvacine	Brain	Leaves	[37]
				2.Mudanpioside E	flatulence, intestinal colic, dysuria		
				3.Picrasidine M	Anti-helminthus		
				4.Muramine	chemical marker - detection of bacterial contamination		
				5.Cimicifugic acid B	headache, toothache, aphtha, sore throat, measles, spot poison, archoptosis,		
				6.Sinomenine	rheumatism and arthritis		
				7.Protostemotinine	leucoderma		
				8.Aconifine	cancer		

				9.Leonuridine	rheumatoid arthritis		
				10. Norisocorydine	human hepatocellular carcinoma		
				11. Picrasidine N	Anti-pediculi		
				12. Sec-O-glucosylhamaudol	allergic diseases		
				13. Evodol	larvicidal activity		
				14. Rugosinone	Nausea, vomiting		
				15. Senkirkine	Suppuration, eczema		
				16. Eclalbasaponin IX	anti-oxidative, antitumor activities		
				17. Kushecarpins A	antiangiogenic activity		
				18. Sanggenon A	hypertension, upper respiratory diseases		
				19. Pectolinarigenin	anticancer agent, anti-inflammatory, anti-allergy, cytotoxic, hepatoprotective		
				20. Piperine	anti-inflammatory, antioxidant, and antitumor properties		
				21. Liensinine	arrhythmias, hypertension, pulmonary fibrosis cancer		
				22. Oxyacanthine	fever, eye disease, jaundice		
13	*Tribulus terrestris Linn*	Gokhru	Zygophyllaceae	**1.**β-carboline alkaloid	sedative, anxiolytic, hypnotic, anticonvulsant, antitumor,	Fruit	[38]

					antiviral, antiparasitic, antimicrobial activities		
				2.tribulusterine	enhance libido		
				3.harmane	antianxiety, antidepressant, antiplatelet, antidiabetic,		
				4.norharmane	Used to keep the urinary tract healthy and reduce swellin		
14	*Tinospora cordifolia*	Giloy	Menispermiaceae	**1.**Berberine	diabetes, high levels cholesterol	Stem, root	[39]
				2.Choline	chronic hepatitis, cirrhosis, memory loss, Alzheimer's		
				3.Palmatine	jaundice, dysentery, hypertension, inflammation		
				4.Tembetarine	boost immune system		
				5.Magnoflorine	anti-anxiety, anti-cancer, anti-inflammation		
				6.Tetrahydropalmatine	heart disease, liver damage		
				7.Tinosporin	Immunity, cancer, AIDS, anti-inflammatory		
				8.Isocolumbin	peptic		

					ulcer		
				9.Jatrorrhizine	Detoxification, anti-hyperglycemic agent		
				10. Aporphine	anti-diabetic, anti-obesity, anti-hyperlipidemic, anti-oxidant, anti-HIV's activities.		
15	*Tecomella undulate*	Rugtrora	Bignoniaceae	**1.** 2-Pyrrolidinemethanol	Respiratory system	Flower	[40]
				2. 3-Amino-4-pyrazolecarbonitrile	anti-inflammatory, arthritis		
				3.Decahydroquinoline	Anti-malaria		
16	*Solanum nigrum Linn*	Makoi	Solanaceae	**1.**solanine A	pneumonia, aching teeth, stomach ache, inflammation, fever	Fruits	[41]
				2. 7*α*-OH khasianine	liver damage		
				3. 7*α*-OH solamargine	contraceptives		
				4. 7*α*-OH solasonine	Contraceptives, steroidal anti-inflammatory		
17	*Sida cordifolia Linn*	Bariar	Malvaceae	**1.** Ephedrine	low blood pressure, asthma	Whole Plant	[42]
				2.Sterculic	anti-parasite drug	Seeds	
				3.Malvalic	nasal congestion		
				4.Coronaric acid	treat eczema, high blood pressure		
				5.Pseudoephedrine	relieve sinus congestion	Leaves	
				7.Phenethylamine	depression, weight	Root and	

					loss	Aerial part	
				8.Vasicine	asthma, chronic bronchitis	Root	
				9.Hypaphorine	osteoclast-based bone loss	Root and Aerial part	
				10.Vasicinol	metabolic disorders.	Aerial part	
				11.tryptamines	Migraines, cluster headaches		
18	*Sida acuta*	Bal	Malvaceae	**1.**Quindoline	pellagra in humans	Aerial Part	[43]
				2.Cryptolepine	Hepatitis, malaria		
19	*Salvadora persica Dence.*	Kharo-jal	Salvadoraceae	**1.**Salvadoricine	cough, fever	Leaves	[44]
				2.Caffeine	mental alertness, painkiller	Bark	[45]
				3.Theobromine	Vasodilator, diuretic, heart stimulant		
				4.Trigonelline	hypoglycemic, hypolipidemic, neuroprotective, antimigraine, sedative, memory-improving, antibacterial, antiviral, and anti-tumor activities, anti diabetic.		
				5.Persicaline	used for curing of ulcers and Parkinson's disease	Stem	
20	*Ricinus communis*	Arand	Ephorbiaceae	**1.**Ricinine	insecticidal	Leaves	[46]
				2. n-haxadecanoic acid	personal care products cosmetics	Leaves	[47]
				3.octadecanoic	hardening		

				acid	soaps, softening plastics, making cos metics, candles		
21	*Prosopis cineraria Macbr*	Khejri	Mimosaceae	**1.**Spicigerine	gastrointes tinal illnesses	Leaves and Flower	[48]
				2.Prosophylline	Piles, muscle tremors	Pods	
22	*Portulaca oleracea*	Lunkha	Portulacaceae	**1.** Dopamine	low blood pressure, low cardiac output,	Stem, leaf and seed	
				2. Noradrenalin	hypotensio n	Stem, leaf and seed	[49]
				3.Oleraceins A	antiseptic	Whole plant	
				4.N-trans-Feruloyltyramin e	antioxidant , antimicrob ial	Aerial part	
				5.(7′R)-N-Feruloylnormeta nephrine	diagnostic tumor of chromaffin cells		
				6. 1,5-Dimethyl-6-phenyl-1,2-dihydro-1,2,4-triazin-3(2H)-one	herbicides		
				7. (3R)-3,5-Bis(3-methoxy-4-hydroxyphenyl) -2,3-dihydro-2(1H)-pyridinone (21)	cancer	Aerial part	[49]
				8.Thymine	beriberi		
				9.N-cis-Feruloyltyramin e	antioxidant , antimicrob ial, anti-melanogen esis, anticancer		
				10. Uracil	Cancer		
				11. N-trans-Feruloyloctopa mine	weight loss		
				12. Aurantiamid e acetate	Antioxidan t, anti-inflammat ory		

23	*Polycarpaea corymbosa*	Pani-ki-mirch	Polygonaceae	**1.** 2-Pyrrolidinone, 1-ethenyl-	jaundice, demulcent, astringent	Whole Plant	[50]
24	*Phyllanthus simplex*	Gujarat-bawal	Euphorbiaceae	**1.**Simplexine	ophthalmopathy	Whole Plant	[51]
25	*Peganum harmala*	Harmal	Zygophyllaceae	**1.**Harmine	Type 1 & 2 Diabetes	Seeds	[52]
				2.Harmaline	antihelmintic		
26	*Nyctanthes arbortristis*	Harsingar	Oleaceae	**1.** 1- (8-Hydroxy-7-((4-nitrophenyl) (phenyl amino) methyl) quinoline-3-yl) propan-2-one	pellagra	Leaves	[53]
				2. 2- (8-Hydroxy-7-((4-nitrophenyl) (phenyl amino) methyl) quinoline-3-yl) acetic acid	Digestives, antidote reptilesvenome.		
27	*Nelumbonucifera*	Kamlani	Nelumbonaceae	**1.**Liensinine	arrhythmias, hypertension, pulmonary fibrosis and cancer	leaves and embryo	[54]
				2.Isoliensinine	cancer		
				3.Neferine	antitumor activities in HepG2 cells and human lung cancer		
				4.Nuciferine	premature ejaculation and erectile dysfunction	Flower Buds	[55]
				5.Nornuciferine	anti-tumor		
				6.*N*-methylasimilobine	promoting conception		
				7.Asimilobine	urinary problems, hematemesis		
				8.Pronuciferine	hematuria		
				9.Armepavine	anti-inflammatory		
				10.*N*-methylcoclaurine	sunstroke		

				11. Coclaurine	cancer		
				12. Norjuziphine	addiction to opioids		
28	*Moringa oleifera*	Sanjna	Moringaceae	**1.***N*,α-L-rhamnopyranosylvincosamide	cancer.	Leaves	[56]
29	*Lycium barbarum*	Morali	Solanaceae	**1.** Na-[(*E*)-cinnamoyl]histamine	seasonal allergies	Leaves	[57]
				2. 5-hydroxy-2-pyridylmethyl ketone	irritation in urinary tract	Fruits	
				3. methyl 5-hydroxy-2-pyridinecarboxylate	dry cough, fatigue		
				4. 2-formyl-5-methoxymethyl pyrrole	blurry vision		
				5.Kukoamines A	infertility		
				6.Kukoamines B			
				7.N1-Caffeoyl-N3-dihydroCaffeoyl Spermidine	Treat lower blood pressure		
				8.Betaine	used to treat abnormally low levels of potassium (hypokalemia), hay fever, "tired blood" (anemia), asthma, "hardening of the arteries" (atherosclerosis), yeast infections, diarrhea, food allergies, gallstones, inner ear infections, rheumatoid arthritis (RA), and thyroid disorders.	Fruits	[57]
				9.Melatonin	delayed sleep phase insomnia r		

					elief		
30	*Leucas aspera Spring*	Chota-halkusar	Labiatae	**1.** β-sitosterol	cholesterol levels	Aerial Part	[58]

Biological activities:

Medicinal Plants are backbone of Indian System ofMedicine.The efficacy of medicinal plants as anticancer, antidiabetic, anti-inflammatory properties are promising and have been widely reported.

Anti-Cancerous

Plants are the source of natural medicine. It has been seen that populations who take natural herbal products have a reduced incidence of different diseases includingcancers. Further studies show that out of 30 medicinal plants 14 plants i.e. *[Jatropha gossypiifolia L. , Heliotropium indicum , Gloriosa superba Linn. , Aerva lanata , Bacopa monnieri , Solanum indicum , Vernonia cinerea Less. , Tribulus terrestris Linn , Tinospora cordifolia , Solanum nigrum Linn , Salvadora persicadence , Portulaca oleracea , Nelumbo nucifera , Moringa oleifera*] of Rajasthan showed anti-cancerous properties predominantly of the family Euphorbiaceae, Boraginaceae, Liliaceae, Amarathaceae, Plantaginaceae, Solanaceae, Asteraceae, Zygophyllaceae, Menispermiaceae, Salvadoraceae, Portulacaceae, Nelumbonaceae, Moringaceae. These plants possess mainly Piperidine, Indicine-N-oxide, Echinatine, Supinine, 3-demethylcolchicine, Canthin-6-one, 10-Hydroxycanthin-6-one, saponin, Indicumine D, Aconifine, Norisocorydine, Eclalbasaponin IX, Pectolinarigenin, Piperine, Liensinine, β-carboline alkaloid, Magnoflorine, Tinosporin, solanine A, Trigonelline, N-trans-Feruloyltyramine, (7′R)-N-Feruloylnormetanephrine, (3R)-3,5-Bis(3-methoxy-4-hydroxyphenyl)-2,3-dihydro-2(1H)-pyridinone, N-cis-eruloyltyramine, Uracil, Liensinine, Isoliensinine, Neferine, Nornuciferine, Coclaurine, N,α-l-rhamnopyranosylvincosamide, lumichrome, Pilocarpinealkaloids to cure and used to treat cancer. Cancer has been major therapeutic area of studied where these plant derived natural product have made significant contribution[59].

Anti-Diabetic Properties

Plants studied during this review article were found with anti-diabetic properties. Diabetes mellitus is a metabolic disorder. Further studies showed that out of 30 medicinal plants 6 plants i.e. [*Bacopa monnieri ,Ziziphus mauritiana, Tribulus terrestris Linn, Tinospora cordifolia, Salvadora persicadence, Peganum harmala*] of Rajasthan possess anti-diabetic properties. These medicinal plants predominately belong to the families Plantaginaceae, Rhamnaceae, Zygophyllaceae, Menispermiaceae, Salvadoraceae, Zygophyllaceae.These medicinal plants possess mainly D-mannitol, Mauritine A, harmane, Berberine, Aporphine, Trigonelline alkaloids which areused to treat or cure diabeties.

Anti-Inflammatory

Many alkaloids present in medicinal plants of Rajasthan were documented for their anti-inflammatory effects. Plants studies during this review article found many anti-inflammatory properties. Inflammation is a response of the body to dangerous stimuli. There are different plants derivatives compound for controlling and suppressing inflammatory crisis[60].Further studies show that out of 30 medicinal plants 18 plants i.e.[*Abutilon indicum, Jatropha gossypiifolia L., Fumaria indica, Aerva lanata,Bacopa monnieri, Ziziphus nummularia, Ziziphus mauritiana, Solanum indicum, Datura stramonium, Vernonia cinerea Less., Tribulus terrestris Linn, Tinospora cordifolia, Tecomella undulate, Solanum nigrum Linn, Salvadora persica Dence, Portulaca*

oleracea, Nelumbo nucifera , Lycium barbarum.] of rajasthanshowed anti-inflammatory property. These medicinal plants predominately belongs to the families [Malvaceae, Euphorbiaceae, Fumariaceae, Amarathaceae, Plantaginaceae, Rhamnaceae, Solanaceae, Asteraceae, Zygophyllaceae, Menispermiaceae, Bignoniaceae, Salvadoraceae, Portulacaceae, Nelumbonaceae]; these medicinal plants possess mainly [Aurantiamide acetate, Methyl indole-3-carboxylate, Cleomiscosin A, Piperidine, Fumariline , Beta-Carboline-1-propionic acid , saponin , Nummularine T, Nummularine H, Mauritine F, Amphibine A, Mauritine F, Indicumine B, Phenylacetoxytropane, Pectolinarigenin, Piperine, Oxyacanthine, harmane, Palmatine, Magnoflorine, Tinosporin, 3-Amino-4-pyrazolecarbonitrile, solanine A, 7α-OH solasonine, Salvadoricine, Aurantiamide acetate, Armepavine, methyl 5-hydroxy-2-pyridinecarboxylate].

Conclusions

Natural products were always being the main source of modern drugs for the treatment, cure and prevention of various human problems, disease including cancer, diabetes, inflammatoryproblems. And still many of the medicinal plants are under clinical trials for the varieties of medicinal compounds. India has always been one of the leading producer of natural medicinal products.

In this review article 30 plants were reviewed and studies for the alkaloids and their efficacy as therapeutic agents. In this screening 15 families were reportedand from these families' approximately 210 alkaloids were present. The study was focused on the plants of Rajasthan, tropic region of India were the temperature goes up to 50° Csummers and the annual rainfall ranges between 200-400mm and it may range to 150mm at the extreme dry regions (desert area). Plants surviving in such harsh condition possess amount of alkaloids which provides medicinal properties to the mankind and also provide the defense mechanism to the plants. These alkaloids rich plants can be alternative source of diet and replace the nutraceuticals as therapeutic targets in future

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