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Review on *Nyctanthes arbor-tristis*: A Night-Flowering Jasmine

***Ms. Shinde Sharayu S., [2]Ms. Ayanar Snehal B., [3]Ms. Shitole Sakshi A., [4]Ms. Chhapre Snehal R., [5]Mr. Tambe Piyush S.**

[1]Student, [2]Assistant Professor, [3]Student, [4]Student, [5]Student

[2]Department of Pharmaceutics,

[2]Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, 415606. India.

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ABSTRACT

One of India's most beneficial traditional medicinal plants is Nyctanthes arbortristis. It is widely dispersed over the sub-Himalayan areas and south to the Godavari. Every portion of the plant has some significant medical value and can thus be used for profit. It is today regarded as a valuable source of several distinctive products for the creation of several industrial items as well as medications against various disorders. In Ayurveda, Nyctanthes arbortristis (Parijata), a medicinal plant, with great therapeutic potential. Ayurveda is one of the oldest medical systems; it uses extracts from plants to treat and manage a wide range of diseases. It is acknowledged as having the most health advantages among India's traditional medicinal herbs. Regarded as a major herbal that manufactures both unique pharmaceutical products and considerable manufacturing value. Its many medicinal uses include laxative, rheumatism, skin conditions, and sedative. It also possesses anti-helminthic, analgesic and anti-inflammatory, antioxidant, hepatoprotective, anti-viral, antifungal, anti-pyretic, anti-histaminic, antimalarial, and antibacterial qualities. In this review an approach has been made to inculcate numerous of features of Nyctanthes arbortristis plant and its medicinal properties.

KEYWORDS: Nyctanthes arbortristis, Parijata, Phytochemicals, Ayurveda, Herbals, Pharmacological action.

INTRODUCTION

One of the valuable medicinal plants in the Oleaceae family is Nyctanthes arbortristis, or N. arbortristis. Typically, tropical and subtropical regions are where the plant grows. N. arbortristis, Harsinghur & Parijat, is a common name for Night jasmine. By daybreak, the plant looks lifeless as the blossoms begin to fall after midnight. The two Greek words "Nykhta" (night) and "anthos" (flower) are the source of the generic name "Nyctanthes". (1) It is a well-known and highly beneficial medicinal plant that is a member of the Nyctaginaceae (Oleaceae) family. Because it emits a strong, pleasant aroma all night long, it is also known as Night Jasmine or Harsinghar. Nyctanthes arbortristis is a modest, revered ornamental tree that is well-known throughout the nation for its beautiful white blossoms and scent. Ten meters tall, N. arbor-tristis has rough leaves, immature branches, stiff, whitish hair, and flaking grey bark. (2) Natural remedies can be made from a variety of medicinal plants found in the environment. One of the most beneficial plants in India's traditional medical repertoire is Nyctanthes arbor-tristis Linn, also referred to as night jasmine or parijatak. (3) Since ancient times, herbs have always been the primary type of medicine, and they are currently gaining popularity all over the world. In addition to offering conventional and ethnic treatment, herbal remedies have potential for producing extremely effective new bioactive compounds. Medicinal plants include a variety of chemical substances that can be used as medications. They can also be a source of new lead molecules and hints for contemporary drug design through synthesis. Common names for Nyctanthes arbor-tristis include Parijataka and Night jasmine. Bark and leaves have anti-bilious and expectorant properties. Bark is thought to be helpful in the healing of wounds, particularly fractured bones, when combined with arjuna sadada. For recurrent fever, bark decoction is advised. One of the most beneficial traditional medicinal plants in India is Nyctanthes arbortristis. Every portion of the plant can be used for commercial purposes because it has some medical benefit. It is currently regarded as a valuable source of several distinctive products for the creation of several industrial items as well as medications against various disorders. Because of its beneficial effects on health, Nyctanthes arbortristis is utilized medicinally in all parts of the plant. (4)

CLASSIFICATION (5)

- ✓ Kingdom: Plantae
- ✓ Class: Eudicots
- ✓ Division: Angiosperm
- ✓ Order: Lamiales
- ✓ Family: Oleaceae
- ✓ Genus: Nyctanthes
- ✓ Species: arbor-tristis

VERNACULAR NAMES (6)

- ✓ Sanskrit: Parijatha
- ✓ Malayalam: Parijatakam
- ✓ Bengali: Sephalika
- ✓ Kannada: Parijatha
- ✓ Oriya: Gangasiuli
- ✓ Hindi: Harsingar
- ✓ Telugu: Pagadamalle
- ✓ Gujarati: Jayaparvati
- ✓ English: Night Jasmine, coral jasmine, tree of sorrow
- ✓ Marathi: Parijathak

DISTRIBUTION

It grows well in deciduous forests and arid hillsides. It is indigenous to southern Asia and grows in a variety of seasons and rainfall patterns from sea level to 1500 meters above the surface. It grows in the Godavari, East Assam, West Bengal, Tripura, Himalayas, and Jammu and Kashmir in India. (7)

CULTIVATION OF PLANT

Because of its exquisite flowers and fragrance, it is frequently grown in gardens. The shrub can be spread by both seeds and pruning. It has been discovered that phenolic chemicals that seep out of the ingested seeds are the reason for the low germination rate of the seeds. With the help of the seed coat, these inhibitory phenolic chemicals were retained in the pericarp. Eliminating both increases the rate of germination. Before germination, seeds are treated with a solution of antioxidants such as polyvinyl pyrrolidine and polyvinyl polypyrrolidine. (2)

BOTANICAL DESCRIPTION

Nyctanthes arbortristis Linn. can reach a height of ten meters. Depending on how old the plant is, its bark might have a dark grey or brown hue and a rough texture. Because of the circular bark flaking off, the bark's surface has become pitted, and the patches of grey and brown colour make it uneven. The inner bark is silky and has a creamy white colour. It is obvious that there are phloem zones that are collapsed and those that are not. The leaves are arranged opposite one other, with the potential for oval or acuminate shapes and entire or serrated margins. The petioles feature an axial concavity and range in length from 5-7 to 7.7-10 mm. They are hairy and long. There is a reticulate venation and a unicostate. The lamina is elliptical in form, with an acuminate or sharp point at the tip. The cymes are hairy, slender, and rather short, and the flowers are tiny and scented. There are trichotomous flowers. The calyx is narrowly campanulate and measures 6 to 8 millimetres in length, whilst the bracts are widely oval, apiculate, and hairy on both sides. The corolla is glabrous, and it has an orange colour in its tube. Six-petaled flowers are very noticeable, however seven-, eight-, or nine-petaled blossoms are extremely rare. The dark, flat, heart-shaped fruits are split into two halves, each of which contains one seed. For best growth, the soil should be loamy. The testa coating is thick and thick, and the seeds are hard and exalbuminous. The outermost layer is amorphous, large, see-through, and extensively vascularized. (8)

MORPHOLOGICAL CHARACTERS (1, 9,10,14)

Leaves

The leaves are opposite, measuring 5 to 10 cm by 2.5 to 6.3 cm, oval, acute or acuminate, whole or with a few big distant teeth, and are rounded or somewhat cuneate in shape. The petiole is 6 cm long and hairy, and the main nerves are few and noticeable beneath. The leaves are simple, and etiolate. The lamina is oval in shape and has an acute or acuminate apex. The border is entire or serrated and somewhat undulating, especially close to the base. The bottom surface is pale green and softly pubescent, while the upper surface is dark green with dotted glands. There are typically 12 lateral veins that emerge from the midrib in the unicostate, reticulated NAT venation. With an adaxial concavity, the petioles are roughly 5-7.7-10 mm in length. (9)

Flowers

The blossoms are used to cure piles and various skin problems, as well as for ophthalmic, gastrointestinal, intestine, expectorant, and hygienic purposes. The vibrant orange corolla tubes of the flowers contain a colouring agent that is the same as crocetin, which is present in saffron. In the past, silk was occasionally dyed with safflower and the corolla tubes. The flowers have various medicinal uses, including treating piles and various skin ailments, as well as stomachic, carminative, astringent to intestine, antibilious, expectorant, and toiletry purposes. The vibrant orange corolla tubes of the flowers contain a colouring ingredient called nyctanthin, which is the same as crocetin in saffron. The corolla tubes have historically been used to colour silk, sometimes in combination with turmeric or safflower. The blooms are sessile, small, and fragrant in 3-5 fascicles of pendaculate bracteates. The peduncles of short terminal trichotomous chymes are single, auxiliary, hairy, slender, and four-angled. Bracts are apiculate, oblong, 6–10 mm long, and hairy on both surfaces. The tube is 6 to 8 millimetres long, orange in colour, and roughly the same length as the limb. The lobes are white, cuneate, and unevenly obcordate. The calyx Carolla is constricted and is 6 to 8 mm in length. (10)

Fruits

The fruits of N. arbortristis are 1-2 cm diameter, long and broad, compressed, obcordate orbicular, two-celled capsules that split into two flat, one-seeded carpels, reticularly veined, and glabrous. Fruit characteristics under the microscope: the fruit is brown, flat, and rounded to heart-shaped. Its diameter is about 2 cm, and it has two transversely oriented cells that open transversely from the apex, each of which holds a single seed. Fruit displayed its characteristic characteristics when examined under a microscope. Compactly packed epidermal cells, polygonal cells with somewhat anti-clinical walls and a thin cuticle covering them, were found in the epicarp. This was followed by 1-3 layers of collenchyma, Spongy Parenchymatous tissue, Sclerenchymatous fibres, and oil glands. (1)

Seeds

Each cell contains one compressed seed. Phytosterols, phenolic substances, tannins, exalbuminous, test-thick seeds of N. arbortristis. (9)

Stem & Bark

A large bush with four branches might reach a height of ten meters. The NAT herbal's bark is extremely tough and has a tone that is either dark or earthy. The uneven and dimpled bark surface is caused by the uneven and faintly colored earthy-hued shading areas. This is caused by the scaling off of roundabout barks. The smooth, white, fragile, and imploding inner bark has a clearly visible non-fell phloem zone. (10)

Leaves

Antibilious, expectorant, utilized in fever and rheumatism, cholagouge juice, laxative, diaphoretic, diuretic, liver disease, and anthelmintic. Decoction administered in sciatica**.** (14)

Flowers

Flowers include glycosides such as -digentiobioside ester of -crocetin (or crocin-1) and -monogentiobioside--D monoglucoside ester of -crocetin**.** (14)

Bark

Alkaloids and glycosides are present in the bark. (14)

PHYTOCOSTITUENTS OF NYCTANTHES ARBOR-TRISTIS

Compounds such as terpenes, steroids, glycosides, flavonoids, alkaloids, and aliphatic chemicals have been isolated and reported from N. arbor-tristis. Alkaloids and glycosides are examples of secondary metabolites that make up the majority of the plant's chemical components. In addition, certain iridoid and phenylpropanoid glycosides are present. From its seeds, the iridoid glucosides A, B, D, and E have been identified. Scientists have found that these bioactive substances can control immunological reactions and help combat leishmaniasis. (11)

USES OF NYCTANTHES ARBOR-TRISTIS

Medicinal Use

The plant's nearly all parts have been used to cure a wide range of illnesses and pathological disorders. Because this plant's leaves contain phytochemicals like flavonoids and glycosides, it is anticipated that they will also have antibacterial, antifungal, anti-inflammatory, and anti-pyretic effects. Conversely, flowers have diuretic, antioxidant, and anti-filarial properties. Whereas the seeds are antifungal, antibacterial, anti-leishmanial and immunomodulatory. Still, the stem appeared to have antioxidant and antipyretic properties. The barks do, however, have antibacterial properties. Besides, the flower oil has found considerable usage in cosmetic sectors as perfumes. Many researchers have recently investigated the potential medical benefits of the bioactive components of N. arbortristis L.'s leaf, flower, fruit, and seed. (12)

Traditional Use

Flowers provide a wide range of therapeutic benefits, including enhancing digestion, lowering mucus production, curing wounds and ulcers, and delaying the onset of grey hair. Similar to crocetin, a yellow pigment found in saffron, the blooms also contain crocin. In the past, flowers were occasionally dyed in conjunction with turmeric or sunflower. In addition to its ability to reduce muscle tension and cure skin problems, flowers can help treat infertility in women. These flowers can treat mouth ulcers and are beneficial to dental health. In addition, flowers may stimulate hunger, lessen flatulence, and soothe inflammation. Gout can also be treated using these flowers. Applying flower water to the hair helps stop grey hair and baldness. (13)

PHARMACOLOGICAL APPLICATION OF NYCTANTHES ABOR-TRISTIS

Anti-Bacterial Activity

According to a study, N. arbortristis leaf methanolic extract shown strong antibacterial activity against Staphylococcus aureus, Staphylococcus epidermis, Salmonella typhi, and Salmonella Para typhi A, with MIC values ranging from 1 to 8 mg/ml. The common medications fluconazole and ciprofloxacin were compared with the extracts' zone of inhibition and Minimum Inhibitory Concentration (MIC). It was discovered that the ethanol and petroleum ether extract solely exhibited antibacterial activity, while the chloroform extract exhibited both antifungal and antibacterial properties. (4)

Antioxidant Activity

The DPPH radical scavenging activity of the obtained extracts was used to estimate their antioxidant potential based on their DPPH free radical activity. The scavenging impact of the plant extracts on the stable DPPH free radical activity was used to evaluate their antioxidant activity. 40 l of extract solution at various doses (0.02-2 mg/mL) was mixed with an ethanolic DPPH solution (0.05 mM). Fresh DPPH solution was made and stored at 4°C in the dark. After adding 2.7 mL of 96% ethanol, the liquid was forcefully shaken. After allowing the mixture to stand for five minutes, the absorbance at 517 nm was determined using spectrophotometry. The absorbance was adjusted to zero using ethanol. Additionally, a blank sample with the same concentration of DPPH and ethanol was made. All the determinations are performed in triplicate. (15)

CNS Depressant Activity

An experiment was conducted using the water-soluble component of ethanol extracts from the flowers, barks, seeds, and leaves of NAT to assess the plant's depressive effect on the central nervous system. It has previously been shown that the bloom has sedative properties and that the leaves offer hypnotic and soothing effects. The Soxhlet extraction method was utilized to extract the plant's ethanol, and adult male Swiss mice were employed to evaluate the pharmacological effectiveness of the extract. After receiving pentobarbital sodium, mice's sleep duration was measured to assess the depressive effect on the central nervous system. A putative mechanism of the action was investigated by measuring the impact on monoamine brain neurotransmitters, such as dopamine and serotonin. The ethanolic extract of NAT, which contains its leaves, flowers, seeds, and bark (600 mg/kg), has been shown to have some muscular relaxant and significant central nervous system depressant effects. In the leaves, flowers, seeds, and bark, sleep was

markedly and dose-dependently prolonged; this was comparable to the effects of the prescription drug chlorpromazine. It was discovered that the leaves had the strongest depressant effect on the central nervous system. It was also discovered that the brain's elevated serotonin and lowered dopamine levels may be the cause of the extract's action. (16)

Hepatoprotective Activity

The metabolism, secretion, storage, and detoxification of both endogenous and foreign substances are carried out by the liver. In Wistar male rats administered antituberculosis medications (isoniazid, rifampicin, and pyrazinamide), the ethanolic extract of NAT leaves (500 mg/kg) had a hepatoprotective effect by lowering the levels of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and total bilirubin. The hepatoprotective activity of β-sitosterol may be dependent on the availability of nyctanthic acid, arborsides A, B, and C, and β-sitosterol in the extract; however, information about the hepatoprotective mode of action of these substances is not yet accessible. In this field of study, more investigation is required. (17)

Anti-Malarial Activity

To assess the antimalarial activity of a fresh paste made from medium-sized N. arbor-tristis leaves, some researchers have employed it. Ninety-two (76.7%) of the patients had their conditions resolved after using it three times a day for seven to ten days. Eight of the thirty patients did not respond to the medication, whereas twenty of the patients were cured in less than a week. The paste exhibited no notable negative effects and was well-received. When tested against three significant mosquito vectors, Aedes aegypti, Culex quinquefasciatus, and Anopheles stephensi, the methanolic and chloroform extracts of leaves killed the larvae with LC50 values of 244.4 and 747.7 ppm, respectively. (18)

Anti-Inflammatory Activity

Carrageenan-induced hind paw oedema method: This test was conducted using Winter et al.'s methodology. A plethysmometer was used to measure the paw volume. Fourteen groups of six mice each were created from the mice. Group II was given regular medication (melonex at a dose of 5 mg/kg), whereas Group I was kept as the vehicle control. N. arbor-tristis leaf extracts in ethanolic, hydroethanolic, aqueous, and chloroform forms were given orally to Groups III–XIV at dose rates of 250 mg/kg, 500 mg/kg, and 1000 mg/kg body weight, respectively. An oral N. arbor-tristis extract pretreatment was administered to the animals 30 minutes before the carrageenan injection. A subcutaneous injection of 0.1 ml of 1% carrageenan was administered beneath the right hind paw's planter surface. The volume of the paw oedema was measured using a plethysmometer at various intervals. (19)

Immunomodulatory Activity

The immunostimulant activity was listed in the ethanolic extracts from the seeds, leaves, and flowers. The mechanism of action linked to the lipids was more active in seeds. The aqueous fraction of 50% ethanolic extracts made from flowers and foliage exhibited high activity. The root and seed aqueous ethanolic extract's immunostimulant qualities against mice's candidiasis were made evident. (20)

Immunostimulant Activity

When extracts of this plant's seeds, flowers, and leaves were given to mice fed 50% ethanol, the results showed a strong activation of both antigen-specific and non-specific immunity, as evidenced by an increase in humoral and delayed hypersensitivity reactions, red blood cells from sheep, and the macrophase migration index. The highest level of activity is present in seeds, where the active components seem to be mostly lipid-related. It was found that the alcoholic and aqueous extracts showed significant hepatoprotective activity (total and direct) by reducing the severity of SGPT, SGOT, and serum bilirubin. The results were validated by histopathological examinations of liver tissues, which showed that the extracts could regenerate hepatocytes. When the plant's 50% ethanol leaf extract was tested for antitrypanosomal effectiveness, it was discovered to have substantial action. (21)

Wound Healing Activity

On Wistar albino rats, the ability of NAT to heal wounds was examined. for sixteen days, the rats were given a 2% w/w NAT methanolic extract treatment. It was discovered that both excision and incision wounds need roughly 16 days to fully epithelize before they healed. The conclusion was that NAT extract at a dose of 300 mg per kg would be a good way to cure both kinds of wounds. (22)

Anthelmintic Activity

Nyctanthes arbor-tristis leaf extracts in aqueous, chloroform, and acetone were found to have anthelmintic efficacy against Phereima posthuma, an Indian earthworm. The findings showed that every tested extract of Nyctanthes arbortristis exhibited dose-dependent anthelmintic activity. Of all the extracts, the most promising anthelmintic action was demonstrated by acetone extract at a concentration of 0.5 mg/ml 44. (23)

Anti-Anxiety Activity

Anxiolytic properties are present in hydroalcoholic extracts of N. Arbortristis (NAT). Using a hydro-alcoholic mixture, the dried manufacturing corridor of N. Arbortristis was uprooted, the detergent was concentrated by distilling it out, the water bath was faded to blankness, and the water bath was also kept in a refrigerator in a watertight container until it was needed. (24)

Anti-Cancer Activity

The prevention of cancer is believed to be greatly enhanced by the ingestion of dietary flavonoids and other polyphenols derived from medicinal plants. Mice with methyl cholanthrene-induced fibrosarcoma have demonstrated efficacious responses to the anticancer properties of two iridoid glycosides, Arbortristosides A and B, derived from Nyctanthes arbortristis. 2.5 mg/kg was shown to be the ideal dosage for these drugs [33]. The study involved the chemical component 4-hydroxyhexahydrobenzofuran-7-one being extracted from NAT leaves. For the aim of experimental evaluation, the chemical was then given to Ehrlich ascites carcinoma cells at a dosage of 20 mg/kg. The drug revealed no negative effects and a 43.27% inhibition of cell proliferation. Tested on mice fibroblast cells and red blood cells, Nat-ZnO nanoparticles which were synthesized using the floral extract of the Nyctanthes arbortristis (NAT) plant showed potent anti-cancer capabilities. In cancer cells, these nanoparticles successfully induced programmed cell death. (25)

Anti-Fungal Activity

The antifungal activity of several NAT plant components was tested against the three clinically harmful fungi Aspergillus niger, Penicillium, and Aspergillus flavus, which are the most common. After collecting and drying both young and old leaves, seeds, stems, bark, and flowers, distilled water, methanol, and chloroform were used for the extraction process. By measuring the "zone of inhibition" of fungal growth, the well diffusion method was used to determine the extracts' antifungal activity. The findings showed that the sole distilled water extract of NAT's stem and bark exhibited antifungal efficacy against A. niger, whereas the leaf chloroform extract was only useful against A. flavus. Methanolic extract of NAT's leaves, stem, and bark demonstrated the strongest antifungal activity against both Aspergillus, penicillium according to the study. (26)

Antipyretic Activity

Nyctanthes arbortristis is prized for its ability to lower fever due to its antipyretic properties. Conventional preparations made from the plant's leaves and blossoms are used to treat foetal problems and bring back healthy cancer cells in the body. All things considered, Nyctanthes arbortristis has a multitude of therapeutic benefits, such as anti-inflammatory, analgesic, antipyretic, antioxidant, hepatoprotective, antidiabetic, and anti-cancer characteristics. The plant's existence of several bioactive chemicals is responsible for these characteristics. To completely comprehend the mechanisms of action and investigate the plant's potential in the creation of therapeutic interventions, more investigation and clinical investigations are required. (27)

Anti-Diabetic

The anti-diabetic activity of methanol extract of root of N. arbortristis is comparable to that of diabetic control animals. The extract poses safe and strong anti-diabetic activity. The extract was prepared by extracting 50g root powders with400mL of methanol for 18 hours by hot continuous extraction method. The methanolic extract was filtered and partitioned by using petroleum ether to remove impurities. The solvent was evaporated under pressure and dried in vacuum. The dried extract N. arbortristis thus obtained was used for the assessment of hypoglycaemic activity. It reduces blood glucose level after seven days at the 500 mg/Kg in rats compare with standard drug. It was found that methanolic extract of N. arbortristis roots were more effective in reducing the blood glucose level compare to the standard drug. (28)

Anti-Viral Activity

The ethanolic extract, n-butanol fractions, and two pure chemicals, arbortristoside A and arbortristoside C, that were extracted from Nyctanthes arbortristis had strong inhibitory effects on the Semliki Forest Virus (SFV) and the encephalomyocarditis virus (EMCV). EMCV-infected mice were protected against SFV by 40 and 60%, respectively, by the in-vivo ethanolic extract and the n-butanol

fraction when given daily dosages of 125 mg/kg weight. Nyctanthes arbortristis Linn. is evaluated in a laboratory. Flower extract and its isolated component, according to Culex quinquefasciatus, are effective against common floral vectors (dip. There are just two publications on the antiviral activity of ethanolic extract, n-butanol fraction, and Arbortristoside A and C that were extracted from the plant's seed. These results were made against the Semlinki Forest virus and the Encephalomyocarditis virus. (29)

Anti-Allergic Activity

When guinea pigs exposed to histamine aerosol were given a water-soluble portion of the alcoholic extract of Nyctanthes arbor-tristis leaves as a pretreatment, the onset of hypoxia was significantly delayed. Arbortristoside A and Arbortristoside C, two anti-allergic substances found in Nyctanthes arbortristis. (30)

CONCLUSION

The Nyctanthes arbortristis plant was the subject of the current investigation. It's a beautiful fragrant plant with many therapeutic uses. All parts of the plant may have pharmacological effects. Nyctanthes arbor-tristis is generally accessible, and there are no special conditions needed for its harvesting or cultivation. Because it effectively treats a wide range of acute and chronic illnesses, Nyctanthes arbortristis has been in great demand for a long time. The purpose of this research is to demonstrate the therapeutic potential of Nyctanthes arbor-tristis and its constituents in the avoidance and management of disease. Based on this study, we can deduce that the examined papers aim to stimulate the curiosity of scientists searching for new drugs made from Nyctanthes arbor-tristis and its constituent chemicals. In the future, the recovered compounds will probably be investigated for additional clinical research and may be added to current treatments.

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Author Name: Ms. Shinde Sharayu S.

Author Affiliation: Student, Department of Pharmaceutics.

Author Address/Institute Address: Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, India. 415606.

	Author Name: Ms. Ayanar Snehal B. Author Affiliation: Assistant Professor, Department of Pharmaceutics. Author Address/Institute Address: Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, India. 415606.
	Author Name: Ms. Shitole Sakshi A. Author Affiliation: Student, Department of Pharmaceutics. Author Address/Institute Address: Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, India. 415606.
	Author Name: Ms. Chhapre Snehal R. Author Affiliation: Student, Department of Pharmaceutics. Author Address/Institute Address: Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, India. 415606.
	Author Name: Mr. Tambe Piyush S. Author Affiliation: Student, Department of Pharmaceutics. Author Address/Institute Address: Govindrao Nikam College of Pharmacy, Sawarde, Chiplun, Ratnagiri, Maharashtra, India. 415606.