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Formulation Of Trachyspermum Ammi Hard Candy Lozenge By Using Heating And Congealing Method And General Evaluation Studies Of Lozenges

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ABSTRACT
In pharmaceutics, there are three types of dosage forms which are incorporated with API along with different excipients for treating various diseases. But each dosage form has its own preference in terms of patient acceptance and condition. In fact, Dosage forms are developed to abolish the demerits of previous dosage forms. Lozenges are solid dosage forms, which are prepared by using both sweetening and flouring agents along with API incorporated in it. These are used to treat both local and systemic infections. There are different types of lozenges available in market as antiseptics, local anaesthetics, antibiotics, antihistamines, antitussives, analgesics, decongestants and demulcents etc.
In this Article, formulation and evaluation of lozenges are discussed in detail along with types of lozenges and also explained about importance of Trachyspermum ammi and its pharmacological applications. Furthermore, formulation of Trachyspermum ammi lozenges and general evaluation studies are discussed in detail.
Key words: Trachyspermum ammi, Ajwain, Active pharmaceutical ingredient, Indian pharmacopeia, lozenges, Heating and Congealing Method.

I. INTRODUCTION: -

Lozenges are oral solid preparations that are intended to be dissolved inside the mouth or pharynx. They may contain one or more medicaments in a flavoured and sweetened base and are intended to treat local irritation or infection of mouth or pharynx and may also be used for systemic drug absorption. Lozenges are intended to achieve local effect as soothing and purging the throat. Sometimes they are used to relieve cough. Lozenges are also for systemic effect provided the drug is well absorbed through the buccal linings or when it is swallowed. Lozenges are placed in oral cavity. Since the sublingual lozenges may be impractical due to their size, buccal lozenges are formulated and have been extensively used and are intended to be placed between the cheek and the gums. Though the lozenge dissolution time is about 30 minutes, this depends on the patient; as the patient controls the rate of dissolution and absorption by sucking on lozenge until dissolves. The consequence of this can be high variabilities in amounts of drug delivered each time the lozenge is administered. Sucking and the subsequent production of saliva may also lead to increased dilution of the drug and accidental swallowing.

Classification of lozenges: -
It is classified into two types, based on site of action and texture and composition

1. Local and Systemic Action
2. Chewy or Caramel based Medicated Lozenges
3. Compressed Tablet Lozenges
4. Soft Lozenges
5. Hard Candy Lozenges

Various Types of Lozenges

1. Nicotine lozenges
2. Linc agon lozenges
3. Fungi Lin lozenges
4. Flurbiprofen lozenges
5. Low-dose natural human interferon-alpha lozenges
6. Actiq lozenges
7. Zinc gluconate lozenges and zinc acetate lozenges

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General ingredients used in Lozenges Preparation

Ingredient	Example
Candy base [Sugar, Sucrose free vehicle, Fillers]	Dextrose, sucrose, maltose, lactose. Mannitol, sorbitol, polyethylene glycol (PEG) 600 and 800. Di calcium phosphate, calcium sulphate, calcium Carbonate, lactose, microcrystalline cellulose.
Lubricant	Magnesium stearate, calcium stearate, Stearic acid, PEG, vegetable oil, fats.
Binder	Acacia, corn syrup, sugar syrup, gelatine, polyvinyl pyrrolidone, tragacanth, methylcellulose.
Colouring agent	Water soluble and lanoline dyes, FD and C colour, orange colour paste, red colour cubes etc.
Flavouring agent	Menthol, eucalyptus oil, spearmint, cherry flavour.
Whipping agent	Milk protein, egg albumin, gelatine, xanthan gum, starch, pectin, align and carrageenan
Humectants	Glycerine, propylene glycol and sorbitol.

Trachyspermum ammi

Ajwain, Trachyspermum ammi (L.) Sprague is an annual herbaceous plant belonging to the highly valued medicinally important family, Apiaceae. It is said that the herb is widely grown in arid and semi-arid regions where the soil involves high number of salts. Ajwain has an erect and striate stem involving glabrous or minutely pubescent properties which may grow up to 90 cm tall. Ajwain is widely distributed and cultivated in various regions such as Iran, Pakistan, Afghanistan, and India as well as Europe while it is indigenous to Egypt. The herb is generally grown in October–November and should be harvested in May–June. Usually, greyish brown seeds or fruits of Ajwain are considered for medical and nutritional purposes.

Other names of Trachyspermum ammi

Sanskrit: Yamini, Yaminiki, Yaviniki Assamese: Jain Bengali: Yamani, Yauvan, Yavan, Javan, Yavani, Yoyana English: Bishop's weed Gujrati: Ajma, Ajmo, Yavan, Javain Hindi: Ajwain, Jevain Kannada: Oma, Yom, Omu Malayalam: Oman, Ayanodakan Marathi: Onva Oriya: Juani Tamil: Omam Telugu: Vamu.

Taxonomical classification of Trachyspermum ammi

Kingdom: Plantae, Plant
Subkingdom: Tracheobionta, Vascular plants
Superdivision: Spermatophyta, Seed plants
Division : Magnoliophyta, Flowering plants
Class: Magnoliopsida, Dicotyledons
Order: Apiales
Family: Apiaceae
Genus: Trachyspermum
Species: Ammi

Importance of Trachyspermum ammi fruit

Hence fruits of Ajwain accumulate up to 5% essential oil in its compartments. However, some investigation reported the yield of fruits essential oil up to 9% which may be considerable. Usually, Thymol is the main Ajwain essential oil constituent and may be yielded from 35% to 60%. The non-thymol fraction (Thymene) contains Paracymene, Gamma-terpinene, Alpha-pinene, Beta pinene, α-terpinene, Styrene, Delta-3-carene, Betaphyllanderene, terpinene-4-ol and Carvacrol. On the other hand, in an investigation, carvone (46.2%), limonene (38.1%) and dillapiole (8.9%) were introduced as principal oil constituents. Also oleic, linoleic, palmitic, petroselinic acid, resin acids are isolated from fruits of Ajwain. New glycosyl constituents such as 6-hydroxycarvacrol 2-O-β-D-Glucopyranoside and 3, 5-Dihydroxytoluene 3-O-β-D-Galactopyranoside are recently reported from fruits of Ajwain. Also, a

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steroid like substance and a compound namely 6-O-βGlucopyranosyloxythymol has been isolated from the fruits. Water-soluble extract of Ajwain fruit revealed to involve many compounds such as a new Monoterpenoid, 3, 7-Dimethyloct-3(10)-ene-1, 2, 6, 7-tetrol; new Monoterpenoid Glucosides namely (2S, 6Z)-3, 7-Dimethyloct-3(10)-ene-1, 2, 6, 7-Tetrol 1-O-β-D-Glucopyranoside and 6-Hydroxythymol 3-O-β-D-Glucopyranoside; new aromatic compound glucosides as 2-Methyl-3-Buten-2- ol-β-D-Glucopyanoside Benzyl-β-D-Glucopyranoside and Glucide namely (3R)-2-Hydroxymethylbutane1,2,3,4-tetrol. Other glucosides such as 1-Deoxy-L-Erythritol and 1-Deoxypentitol and also nucleosides as adenosine and uridine were isolated from Ajwain fruits.

Thymol is the main chemical constituent and it can prevent indigestion problems, by activating thyme. Thyme has the ability to prevent the production of excess mucous, bile or stomach acid as well as to relieve pain.

Ajwain was vastly applied by medieval practitioners and it also exhibited different pharmacological effects regarding various chemical ingredients.

Pharmacological activities of Trachyspermum ammi

Analgesic and Antinociceptive Effects, Antibacterial and Antifungal Activities, InsecticidalAssessment, Anthelmintic Activity, Antiplatelet Activity, Anti-inflammatory Effects, Antitussive and Broncho dilatory Effects, Diuretic and Anti-lithiasis Activity, Antihyperlipidemic Properties, Detoxification Activity, Antioxidant Properties, Antiviral Effects, Spermicidal Activity, Hepatoprotective Effects, Antiulcer Activity, Antihypertensive and Antispasmodic Activity, Digestive Stimulant Activity, Toxicity and Teratogenicity.

Formulation of Ajwain lozenges: -

Aim and Objective: -

Aim of the study is to formulatethe hard candy lozenge by using Trachyspermum ammi as main drug and describe general evaluation tests for Lozenges.

To formulate the Trachyspermum ammi lozenge and describe the possible evaluation tests that could conduct during and after formulation.

The main objective is to develop a lozenge which can treat GIT diseases mostly stomach upset and constipation.

Materials and equipment's required

Granulated sugar, Calcium carbonate, Magnesium stearate, Acacia, Sugar syrup, Methyl blue, Peppermint oil, Gelatin, Glycerin, Ajwain [API], Sucrose, Sudan -Ⅲ, Corn starch, Dextrose, Cardamom, Honey, Tragacanth, Food colour, Water, Lemon juice, Salt [NaCl], Menthol crystals, Edible camphor, Ghee, Crude ginger extract.

Copper coated steel kennel, Beakers, Glass rods, Measuring cylinders, Hot air oven, Digital weighing balance, Spatulas, Watch glasses, Petry plates, Thermometer, Tripod stand, Burner, Molds, Aluminum foil, Filter paper, Pipette.

Methodology

Ajwain lozenges are prepared by the method known as heating and congealing method it is also known as direct medicament addition method

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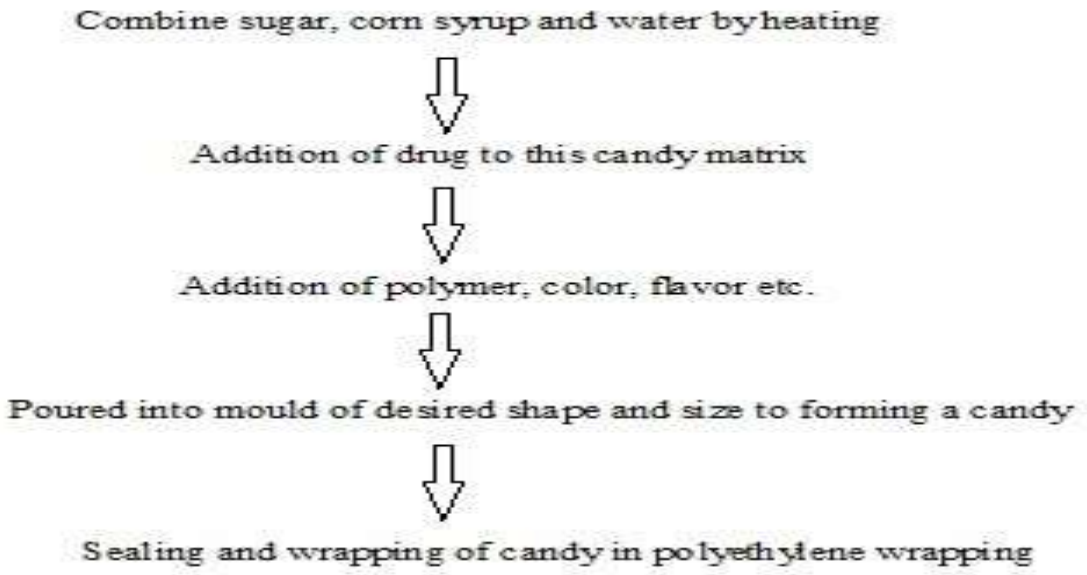

Procurement of Active pharmaceutical ingredient

Ajwain is used as API and it is taken as a very power which is sieved through the mesh No: 125 □ m, and nominal size of aperture is 0.125 mm.

Preparation of corn syrup

Corn syrup is made by acid hydrolysis by using lemon juice which contain citric acid. It is made by adding measured quantities of water, granulated sugar, lemon juice and salt in a vessel and heat up to 110 °C while the thick consistency of syrup is formed.

Preparation of candy base

The candy base is made by adding weighed quantity of sugar into the prepared corn syrup and then heat up to 130-140 °C by using open fire candy base cooker.

Formulation trails:

Trail 1

Ingredients	Quantities	Use
Granulated sugar	132 gm	Candy base sugar
Calcium carbonate	16 gm	Filler (improve flowability)
Magnesium stearate	10 gm	Lubricant (avoid sticking to the teeth)
Acacia	10 gm	Binder
Sugar syrup	66.7 ml	Binder
Methyl blue	q. s	Colouring agent
Peppermint oil	1 ml	Flavouring agent
Gelatine	18 gm	Whipping agent
Glycerine	70 ml	Humectant (improve chew mouthfeel properties)
Ajwain fruit powder	1 gm	Active pharmaceutical ingredient

Ajwain lozenges are prepared by heating and congealing method, where sugar syrup is made by using standard preparation and then add weighed quantity of sugar in it. Heat the mixture up to thick consistency is obtained and then add a mixture which is prepared by adding remain ingredients in a weighed glycerine solution. Heat the content up to 120 °C. Over all process must be done by using copper coated steel kennel only. After the preparation transfer the mixture in to the moulds and then let it cool done to the room temperature.

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Trail 2

Ingredients	Quantities	Use
Corn syrup	25 ml	Binder
Sucrose	28.3 gm	candy base sugar
Calcium carbonate	4 gm	filler
Magnesium stearate	3 gm	Lubricants
Acacia	5 gm	binder
Sudan- Ⅲ	q. s	colouring agent
Peppermint oil	q. s	flavouring agent
Gelatine	4.5 gm	whipping agent
Glycerine	5 ml	humectant
Ajwain fruit powder	1 gm	active pharmaceutical ingredient

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is made by using standard preparation and then add weighed quantity of sugar in it. Heat the mixture up to thick consistency is obtained and then add a mixture which is prepared by adding remain ingredients in a weighed glycerine solution. Heat the content up to 120 °C. Over all process must be done by using copper coated steel kennel only. After the preparation transfer the mixture in to the moulds and then let it cool done to the room temperature.

Trail 3

Ingredients	Quantities	Uses
Sugar syrup	15 ml	binder
Dextrose solution	10 ml	candy base sugar
Water	q. s	vehicle
Hcl	3 ml	solubilizer
Sodium chloride [INS-534]	q. s	colouring agent
Peppermint oil	q. s	flavouring agent
Ajwain fruit powder	3 gm	active pharmaceutical ingredient

Ajwain lozenges are prepared by heating and congealing method, where sugar syrup is made by taking weighed quantities of granulated sugar and water and heated up to 160 °C. Dextrose solution is prepared by using standard method and then add both the mixtures in a copper coated kennel and heated up to 160 °C, a thick consistency mixture is obtained. Now dissolve the API in HCl solution and then add the drug into the mixture along with remaining ingredients in it. After through mixing, poured into the moulds and let it cool down under room temperature.

Trail 4

Ingredients	Quantities	Uses
Corn syrup	16 ml	Binder

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Granulated Sugar	24 gm	Candy base sugar
Tartrazine [INS-102]	q. s	Colouring agent
Peppermint oil	q. s	Flavouring agent
Ajwain fruit powder	125 mg	API

Ajwain lozenges are prepared by heating and congealing method'

Preparation of corn syrup: Take a beaker and then add weighed quantity of corn starch [14.7 gm], and water [118.2 ml], then mix it well. Now add weighed quantity of sugar [128 gm] in the mixture, then put it on flame by transfer all the contents in to a copper coated kennel up to complete dissolve of sugar. Then after add weighed quantity of lemon juice and heat it for 5 minutes. After cool the content, a thick consistency of syrup is obtained.

Candy base is formed by adding weighed quantity of corn syrup and sugar in a kennel and then heat up to 130 °C, then add the remain ingredients into the base mix it well and transfer to the moulds.

Trail 5

Ingredients	**Quantities**	**Uses**
Liquid sugar	156.25 ml	Candy base sugar
Corn syrup	85 ml	Binder
Honey	10 gm	Solvent
Tartrazine [INS-102]	q. s	Colouring agent
Cardamom	250 mg	Flavouring agent
Ajwain fruit powder	125 mg	API

Ajwain lozenges are prepared by heating and congealing method, where weighed quantity of corn syrup and liquid sugar is added in to a copper coated kennel and heated up to 130 °C, then add the remaining ingredients into the above prepared mixture at a desirable temperature. Mix it well and poured into the moulds and let it cool down under room temperature.

Trail 6

Ingredients	**Quantities**	**Uses**
Corn syrup	15 ml	Binder
Granulated Sugar	22.5 gm	Candy base sugar
Tragacanth	125 mg	Binder
Tartrazine [INS-102]	q. s	Colouring agent
Cardamom	250 mg	Flavouring agent
Ajwain fruit powder	62.5 mg	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared and then candy base is prepared by adding weighed quantity of sugar in it. In the base remaining ingredients are added at the desired temperature and then poured on a thin plate to slice the lozenges.

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Trail 7

Ingredients	Quantities	Uses
Corn syrup	25 ml	Binder
Granulated Sugar	45 gm	Candy base sugar
Tragacanth	125 mg	Binder
Tartrazine [INS-102]	q. s	Colouring agent
Cardamom	250 mg	Flavouring agent
Ajwain fruit powder	62.5 mg	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared at 110 °C, and candy base is prepared at 140 °C by adding weighed quantity of sugar in it. Now let it cooldown up to 60 °C and then add all the remain ingredients in the prepared candy base and mix it well and poured in the moulds or spread it on the thin plate and cut into desired slices.

Trail 8

Ingredients	Quantities	Uses
Corn syrup	45 ml	Binder
Sugar syrup	76 ml	Binder
Tragacanth	125 mg	Binder
Tartrazine [INS-102]	q. s	Colouring agent
Cardamom	500 mg	Flavouring agent
Magnesium stearate	350 mg	Lubricant
Ajwain fruit powder	1 gm	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup and sugar syrup are prepared at 80 °C, and then form a candy base by adding both in a copper coated kennel. Candy base is prepared at 110 °C and then decrease the temperature up to 60 °C, then add the remain ingredients in it and mix well, now pour the content in the moulds.

Trail 9

Ingredients	Quantities	Uses
Corn syrup	30 ml	Binder
Granulated Sugar	45 gm	Candy base sugar
Magnesium stearate	350 mg	Lubricant
Corn starch	350 mg	Whipping agent
Tragacanth	150 mg	Binder
Sodium chloride [INS-534]	q. s	Colouring agent
Cardamom	250 mg	Flavouring agent

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Ajwain fruit powder	250 mg	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared at 110 °C, and then candy base is prepared by adding weighed quantity of sugar in the prepared corn syrup. Heat the mixture up to complete dissolve of sugar and then add remain ingredients at the desired temperatures mentioned in the standards. Now mix it well and pour in to the moulds.

Trail 10

Ingredients	**Quantities**	**Uses**
Corn syrup	60 ml	Binder
Granulated Sugar	90 gm	Candy base sugar
Magnesium stearate	1 gm	Lubricant
Corn starch	2 gm	Whipping agent
Tragacanth	2 gm	Binder
Sodium chloride [INS-534]	q. s	Colouring agent
Menthol crystals	120 mg	Flavouring agent
Edible camphor	150 mg	Flavouring agent
Ghee	q. s	Lubricant
Ajwain fruit powder	1 gm	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared at 110 °C, and then candy base is prepared by adding weighed quantity of sugar in the prepared corn syrup. Heat the mixture up to complete dissolve of sugar and then add remain ingredients at the desired temperatures mentioned in the standards. Now mix it well and pour in to the moulds which is lubricated with ghee.

Trail 11

Ingredients	**Quantities**	**Uses**
Corn syrup	60 ml	Binder
Powdered sugar	90 gm	Candy base sugar
Magnesium stearate	250 mg	Lubricant
Corn starch	1 gm	Whipping agent

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Tragacanth	500 mg	Binder
Sodium chloride [INS-534]	50 mg	Colouring agent
Menthol crystals	120 mg	Flavouring agent
Crude extract of ginger	3 ml	Flavouring agent
Honey	3 ml	Solvent
Ghee	q. s	Lubricant
Ajwain fruit powder	150 mg	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared at 120 °C, and then candy base is prepared by adding weighed quantity of sugar in the prepared corn syrup. Heat the mixture up to 140°c and let the sugar completely dissolve and then add remain ingredients at the desired temperatures mentioned in the standards. Now mix it well and pour in to the moulds which is lubricated with ghee.

Trail 12

Ingredients	**Quantities**	**Uses**
Corn syrup	72 ml	Binder
Powder sugar	120 gm	Candy base sugar
Magnesium stearate	250mg	Lubricant
Corn starch	1.5 gm	Whipping agent
Tragacanth	500 mg	Binder
Sodium chloride [INS-534]	50 mg	Colouring agent
Menthol crystals	180 mg	Flavouring agent
Crude extract of ginger	5 ml	Flavouring agent
Honey	q. s	Solvent
Ghee	q. s	Lubricant
Ajwain fruit powder	250 mg	API

Ajwain lozenges are prepared by heating and congealing method, where corn syrup is prepared at 120 °C, and then candy base is prepared by adding weighed quantity of sugar in the prepared corn syrup. Heat the mixture up to 140°c and let the sugar completely dissolve and then add remain ingredients at the desired temperatures mentioned in the standards. Now mix it well and pour in to the moulds which is lubricated with ghee.

Evaluation tests for Lozenges

Since the basis of the lozenge dosage form is sugar and corn syrup, quality control testing begins with

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the analysis of candy base raw materials and continues through to the final packaging operation.

A. Physical Stability

Concurrent with the chemical stability evaluation, a physical stability study is carried out on the product in order to determine what factors will detract from the organoleptic appeal of the product and how long these changes will take to occur. A routine physical stability evaluation includes the following:

Colour: Lozenges are placed in direct sunlight, in a fadeometer, and at elevated temperature to determine if the colours are light-fast. Lozenges are also tested for colour changes occurring due to the presence of medicaments, flavours, or acidulants in the formulation.

Odour: Changes in the odour of flavours stored at elevated temperature conditions are evaluated by sealing the lozenges in glass bottles and determining if any off-odours result.

Taste: The product is tasted and compared to production controls in order to determine if any flavour changes have occurred. Many small flavour changes that cannot be detected via gas-liquid chromatography can be ascertained when the lozenge 1s tasted. Any changes in the surface texture are also evaluated during the taste evaluation.

Hardness: Compressed tablet lozenges are tested for proper hardness using an Instron or schleuniger hardness tester. Chewy caramel products are tested for hardness using an Instron or a penetrometer. The force required to penetrate the tablet is used as a measure of chewiness, surface hardness, and stability.

Grain: Lozenge sticking is noted. When graining occurs, the degree is recorded. The lozenge is broken in half and the grain is measured with an eyepiece fitted with a micrometre gauge. The degree of lozenge graining is usually reported as percentage of lozenge grained.

Bunch wrap appearance: Colour changes that may occur on the paper surface due to medicament or colour reaction with the bunch wrap material, sticking of bunch wrap to the surface of the lozenge, or splitting of the laminate from the foil are evaluated.

B. Flavour Stability

Volatile oils in medicated candies are not only responsible for taste but may also contribute to the antiseptic action of the lozenge. The quantity of volatile oils in the medication can be determined quantitatively or by subjective taste response. The method of choice for determining the loss of flavour oils with time is gas-liquid chromatography. Using the data in accordance with the Arrhenius relationship will enable an estimation of the loss rate of the oils under normal shelf storage conditions.

C. Elevated Temperature and Elevated Humidity Testing

Elevated temperature and elevated humidity testing are initiated as soon as product is manufactured. While the choice of time and temperature storage conditions is left to the discretion of the formulator, an effective stability program should include product storage for 1- 2 months at 60°C, 3- 6 months at 45°C, 9-12 months at 37°C, and 36- 60 months at 25 and 4°C. These conditions are suitable for determining the initial Arrhenius plot relationship and the follow-up confirmatory medicament stability values. As soon as possible, product should be tested in the proposed trade package both at elevated temperature and elevated humidity conditions. Testing conditions generally utilized by the product development laboratory include 25°C at 80% relative humidity for 6-12 months, 37°C at 80% relative humidity for 3 months, and 25°C at 70% relative humidity for 6-12 months. The elevated humidity studies are carried out both at constant humidity and in humidity cabinets with day and night cycling. Elevated humidity tests are vital for ascertaining medicament stability. candy stickiness, surface-graining characteristics, clouding, and development of cold flow. At the same time the moisture protection characteristics that different packaging materials offer to the lozenge are evaluated. Bunch wrap, cartons, carton overwrap, shipping boxes, and bundle wrap are tested. Materials that offer the product maximum protection from moisture are chosen so that optimum warehouse, store, and in-home protection from moisture penetration are afforded the product.

D. General Checks: Candy Base Manufacturing

As the manufacture of the candy base is initiated, a final check of the corn syrup and sugar delivery gears, as well as any third ingredient delivery systems, is made to assure the proper ratios of candy base ingredients are delivered to the precooker. Continual checks are also made on the temperature, steam pressure, and cooking speed of the precooker as well as the steam pressure, temperature, vacuum, and cooking speed of the

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candy base cooker. The cooker speed is adjusted according to the speed of the lozenge-forming machine.

1) Moisture Analysis

Determination of candy base moisture content, regardless of the method used, is a critical procedure in quality control testing to verify that the metering devices and vacuum settings on the candy cookers are performing correctly. Production of candy base with moisture content exceeding 1.0-1.5% increases candy lozenge-manufacturing difficulties, incidence and rate of graining, as well as medicament-flavour and medicament-candy base interactions, all of which tend to shorten product shelf life. For optimum shelf life, moisture content should range from 0.75 to 1. 25% with 1.0% generally the normal manufacturing parameter. A number of different testing procedures are available to determine the percentage of moisture in candy base. Chewy or caramel candy bar-moisture content should range between 3.0-5.0%.

2) Gravimetric Method (Vacuum Oven)

The sample (usually about 1. 0 g) is Weighed accurately into a tared weighing container and placed in a vacuum oven at 60-70°C for 12-16 hr. The sample is removed from the oven, weighed, and the difference in moisture calculated.

3) Titrimetric Method

The titrimetric determination of water depends on the fact that a solution of sulfur dioxide and iodine in pyridine and alcohol (Karl Fischer reagent) reacts with water stoichiometrically. The entire operation requires the rigid exclusion of atmospheric moisture. This method permits the determination of candy base moisture content in a very short period of time (less than 5 min). With this procedure, a sample calculated to contain 10-250 mg of water is added to the titration flask and titrated with Karl Fischer reagent. The end point can be determined visually in colourless solutions; in coloured solutions an electronic method is used.

4) Azeotropic Distillation Method (Toluene or Xylene)

A measured quantity of pulverized candy 10-12 g) is placed into a 500-ml glass flask. Between 150 and 200 ml of toluene is added to the flask, which is connected to a trap with connecting tube and a reflux condenser fitted with a graduated 5-ml-capacity receiving tube. The flask is heated for 1-2 hr, refluxing until all water has come over to the receiving tube-where the percentage that was present in the candy can be calculated from the volume of water present in the receiving tube. During the distillation procedure, care must be taken not to allow the solvent and the residue candy to become discoloured (brown or even yellow) because this is certain indication that caramelizing has occurred. Caramelizing of sugar, with the loss of water from the sugar, would give a high reading.

E. Microbiological Testing

While a continual check is made on the physical and chemical properties of the hard candy lozenges both during and after processing, another problem area that must be considered is microbiological contamination. During the candy base cooking cycle, temperatures are high enough to sterilize the raw materials, but addition of contaminated raw materials on the mixing table. contaminated cooling air, contaminated utensils. or improper hygiene by the production workers can cause bacteria. mould. or spore contamination of the candy. The high solids content will not in itself support bacterial growth. but as the lozenge picks up surface moisture. conditions may be suitable for an increase in bacterial or mould counts. A strain of Salmonella typhosa can persist in hard candy under proper conditions for more than 12 months. The presence of any bacterial, mould. or spore contamination is indicative of a lack of adequate housekeeping or hygiene among the production workers. If microbiological contamination becomes evident. a complete evaluation of all possible problem areas must be carried out until the source is located and eliminated. Routine microbiological testing is as critical as routine analytical evaluation. The quality control department must develop a microbiological sampling plan to effectively determine areas of possible contamination. Raw materials, finished products, machinery. cooling tunnels. environmental conditions, and storage drums are all sources of microbiological contamination. Production workers should be educated
toward proper hygiene. and sufficient washing facilities must be provided. Laboratory microbiological testing should include the following counts: (a) total plate; (b) total coliform; (c) yeast and mould; (d) Escherichia coli; (e) Staphylococcus; (f) Salmonella.

F. Product Release

Once the finished lozenge is determined to be within the physical. chemical, and microbiological specifications set for the product. it is approved for packaging and distribution.

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G. Stability Testing

The previous section described the routine quality control tests necessary to determine if the product is being manufactured according to a series of predetermined formulation guidelines. If these guidelines are followed and the product is within specifications. then an acceptable product will result. Stability testing is not a routine quality control test. but rather an analytical tool to determine the effective product shelf life. Shelf-life determination, or product storage stability testing, is initiated upon completion of the first laboratory prototypes when production begins and at periodic intervals during routine production, and continues for a minimum of 5 years. The purpose of this series of tests is to determine the physical and chemical stabilities of medicament. flavour, candy base, and colour- both under accelerated temperature and humidity conditions and at ambient storage conditions. This testing will enable the formulator to predict the acceptable shelf life of the product in a relatively short period of time and make changes as required to eliminate any incompatibilities that may influence product stability.

H. Arrhenius Relationship

The chemical kinetics of medicament. flavour, and colour in hard candy base is directly applicable to the Arrhenius relationship. This relationship is valid only as long as it is possible to linearize a property of the degradation (drug concentration. flavour content, colour loss) with time. By plotting the property vs. time on arithmetic or semi log graph paper. it is possible to determine whether the degradation is proceeding according to zeroth-order, first-order, or pseudo-first-order reaction. Most materials in candy base degrade by first-order or pseudo-first-order reactions, permitting a measure of the degradation rate from a plot of the logarithm of residual drug concentration vs, time. The slope of the resultant straight line represents the rate of degradation. Plots that do not result in a straight line indicate that the drug is degrading through a more complex reaction. Once the rates of degradation are determined for the medicament in candy base at three or more elevated temperature storage conditions, it is possible to estimate the rate of degradation at room temperature through the use of the Arrhenius relationship. If, by plotting the logarithm of the rates of degradation vs. the reciprocal of the absolute temperature, a linear relationship results, it is possible to determine degradation at room temperature. This makes it possible to calculate the shelf life of the product which, for medicinal, is generally the time it will take for the dosage form to retain 90% of its labelled drug content.

II. RESULTS AND DISCUSSIONS

The present study was aimed to formulate the Ajwain lozenges by heating and congealing method. There are almost 13 trails has been conducted and successfully formulate the Ajwain lozenges.

From trail 1 to trail 10, we face a lot of challenges and finally succeed in trail 11 and 12.

Trail 1 Trail 2 Trail 3

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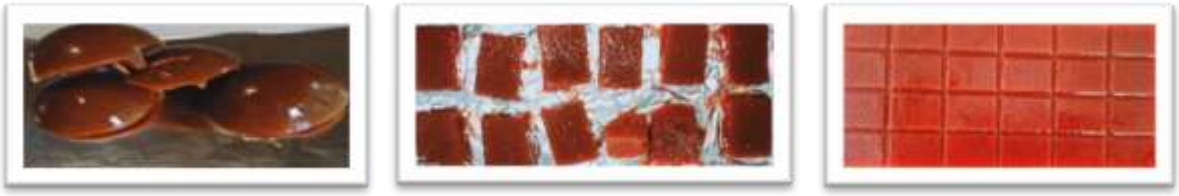
Trail 4 Trail 5 Trail 6

Trail 7 Trail 8 Trail 9



Trail 10 Trail 11 Trail 12

Problems faced during formulation of Ajwain lozenges

During trail 1 to trail 10:

1. Gummy lozenges are formed or lozenges are not perfectly come out from moulds.
2. Temperature is not maintained as standards.
3. Lozenges are not stable at room temperature.
4. Taste is to bitter and sometimes peppermint oil dominates the taste.

III. CONCLUSION

The formulation of lozenges is an easy and time saving process. It is a formulation which is more organoleptically accepted particularly by the paediatrics patients. Medicated Lozenges will be ideal dosage forms for paediatric patients. These will have additional advantages of patient compliance, convenience and comfortness for efficient treatment including low dose, immediate onset of action, reduced dosage regimen and economic. This will offer better innovative dosage form. Lozenges enjoy an important position in pharmacy and will continue to remain at the same in future.

The aim of the present study was to formulate the Ajwain lozenges by using heating and congealing method and it was success during trail 11 and 12.

These Ajwain lozenges are mainly used for treating GI tract related problems. In this study, authors only success in formulation of Ajwain lozenges.Authors want to give some suggestions, that in the future, further studies can be conducted and remaining evaluation tests are suitable to perform and also in vivo studies are preferable to conduct.

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