



FORMULATION AND EVALUATION OF ANTHELMINTIC POLYHERBAL TABLETS



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Abstract

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From time immemorial, man has been depending on plants as medicine. Helminthes infections are among the most common infections in man, affecting a large proportion of the world's population. Helminthiasis is an infection of the human body with parasitic worm such as roundworms, earthworms, hookworms, flukes, tapeworms and pinworms. The worms usually only involve the intestinal tract but sometimes they may invade other organs. These helminthic diseases can be treated by various herbal drugs. The present study was done with the aim to formulate antihelmintic tablets using traditionally valuable herbs like *Neolamarckia cadamba* and *Alstonia scholaris*. A spray dried powder was used, which was obtained from the extract of different part of plants that were used in helminthic disease.

INTRODUCTION

Helminthiasis is a macro parasitic disease of humans and animals in which a part of the body is infected with parasitic worms such as pinworm, roundworm or tapeworm. Worms often live in the gastrointestinal tract, but may also burrow into the liver or lymphatic system or other organs.¹ throughout the world; the parasitic helminthic infection increases the mortality and morbidity day by day. This includes the intestinal nematodes (roundworms), trematodes (flukes) and cestodes (tapeworms). It is unevenly distributed disease in low income countries which affected worstly and highest risk of morbidity because it is the major source of environmental contamination and transmission.²

Plants are always an exemplary source of drug. In fact, many of the currently available drugs were derived either directly or indirectly from the plants. The plant kingdom represents a rich source of organic compounds, many of which have been used for medicinal and other purposes.³ The plant *Neolamarckia cadamba* (Roxb.) Bosser (Family: Rubiaceae) is commonly

known as Kadam.⁴⁻⁵ The barks and leaves of the plant are reported to have various medicinal uses such as astringent, anti hepatotoxic⁶, anti diuretic, wound healing, antiseptic⁷ and anthelmintic⁸. The pharmacognostical study of leaves and bark of the plant are also reported⁹⁻¹⁰.

The plant *Alstonia scholaris* (Family: Apocynaceae) is commonly known as Saptaparna. The plant is native to India and grows in deciduous and evergreen forests and also in plains. The bark is useful in malarial fevers, abdominal disorders, dyspepsia and in skin diseases.¹¹ The bark is bitter, astringent, digestive, laxative, anthelmintic, antipyretic, stomachic, cardiogenic and tonic.¹² The bark extract has been reported to possess antiplasmodial, immune stimulant, anticancer effect and is also hepatoprotective.¹³⁻¹⁴

The oral route of drug administration is the most important method of administering drugs for systemic effects. Except in few cases, parenteral route is not routinely used for self administration of medications. It is probable that most of drugs used to produce systemic effects are administered by the oral route. Ayurvedic herbal

formulations were also administered preferentially by oral route.¹⁵ Ayurvedic formulary of India specifies the dose of herbal drugs. However, dispensing and consumption of powder is inconvenient to the patients. Hence, in the present investigation, an attempt was made to prepare formulation of anthelmintic tablet and improve patient compliance and acceptability.

Designing of oral herbal formulations is till date a challenge in modern pharmaceuticals. There are number of medicinal herbs in traditional system of medicine which are time tested, useful for the number of ailment. In present study leaves of *Neolamarckia cadamba* and barks of *Alstonia scholaris* were selected for developing the polyherbal antihelminthic tablet.

MATERIALS AND METHODS

Plant Material

The leaves of the plant *Neolamarckia cadamba* (Roxb.) Bosser and barks of *Alstonia scholaris* were collected from Botanical Garden, Gandhinagar. The plant materials were identified and authenticated

by Dr. Nainesh R. Modi, Botanist, M.G.Science Institute, Ahmedabad, Gujarat.

Chemicals

All tablet excipients were supplied by Chemdyes corporation, Rajkot, India. All other chemicals used in the study were of analytical grade.

Physicochemicals properties of different plant powders¹⁶⁻¹⁸

Ash values:

Total ash value:

Weigh accurately into a previously ignited and tarred crucible, usually platinum or silica, about 2-3 g of the ground material. Spread the material in an even layer in the crucible. Ignite the material by gradually increasing the temperature to 500-600° C until free from carbon, cool in desiccators and weigh. Cool the crucible and moisten the residue with about 2 ml of water or a saturated solution of ammonium nitrate, dry on the water bath and then on the hot plate and ignite to constant weight. Then, calculate the content of total ash in mg/g of the air-dried material.

$$\text{Formula: } \frac{W'_3 - W_1}{W_2 - W_1 (100 - H)} \times 100^4$$

W_1 = Empty crucible weight, W_2 = Crucible + sample weight, W_3 = Crucible + sample weight after burning, W'_3 = Weight after desiccate, H = Loss on drying

Acid insoluble Ash:

To the crucible containing total ash, add 25 ml of HCl, cover with a watch glass and boil for 5 min. then, rinse the water-glass with 5 ml of hot water and add this liquid into the crucible. Collect the insoluble matter on the ash less filter paper and wash with hot water until the filtrate is neutral. Transfer the filter paper containing the insoluble matter to the original crucible, dry on a hot plate and ignite to constant weight. Allow the residue to cool in suitable desiccators for 10 min and weigh without further delay. Calculate the content of acid insoluble ash in mg/g of the air-dried material.

$$\text{Formula: } \frac{W'_4 - W_1}{W_2 - W_1 (100 - H)} \times 100^4$$

W_1 = Empty crucible weight, W_2 = Crucible + sample weight, W_3 = Crucible + sample weight after burning, W_4 = Burn filter paper

+ crucible weight, W'_4 = Weight after desiccate, H = Loss on drying

Moisture content:

Moisture content was determined by the oven method. Weigh accurately about 2-5 gm of the prepared material or quantity given in the test procedure or previously dried and tarred Petri dish. Dry in an oven at 100-105°C for 5 h until two consecutive weights do not differ by more than 5 mg, unless otherwise required in the test procedure. Calculate the loss of weight in mg/g in the air-dried material.

$$\text{Formula: } \frac{W_2 - W'_3}{W_2 - W_1} \times 100$$

W_1 = Empty petri dish weight, w_2 = Petri dish + sample weight, w_3 = petri dish + sample weight after oven, W'_3 = Weight after desiccate, H = loss on drying

Water soluble extractive:

The water soluble extractive gives the amount of herbal raw material that can be extracted through water.

Transfer the weighed sample 2g into a stoppered flask, add 100 ml of water and stopper the flask. Shake at approximately

30 min intervals for 8 h and keep overnight. Shake and filter the extract. Evaporate the half volume of the extract to dryness in a preweighed petri dish on a water bath. Heat it in an oven at 105°C and cool to constant weight.

$$\text{Formula: } \frac{W'_2 - W'_1}{(100 - H)} \times 100^4$$

H = Loss on drying, W_1 = empty petri dish weight, W_2 = petri dish + sample weight, W'_2 = weight after desiccate

Formulation development of polyherbal antihelminthic tablets¹⁹⁻²⁰

Herbal tablets of leaves extract of *Neolamarckia cadamba* and barks extract of *Alstonia scholaris* were prepared by wet granulation method using PVP K30 and starch mucilage with varying concentration (4, 6, 8 % W/W) as binder. These granulaes were evaluated for various physical properties like bulk density, tapped density, Hausner ratio, compressibility index and angle of repose. Composition is given in table 1. All ingredients were weighed accurately and mix well in dry mortar. Talc and magnesium stearate were used as lubricants. Tablets were prepared by

compressing granules in rotary tablet compression machine using 9 mm flat punch. Tablet formulations prepared were coded as W1 to W6.

Evaluation of formulated tablet²¹

All the formulated tablets were subjected to following evaluation parameters.

A) Colour and Appearance

The compressed tablets were examined for their colour and appearance

B) Tablet thickness

The thickness of 10 tablets each selected at random from the formulated tablets was determined using a vernier caliper and the mean of these readings was taken as the mean tablet thickness.

C) Weight variation test

The average weight was determined by randomly selecting and weighing 20 tablets. Each tablet was also weighed individually. The deviation from the average weight in each case was calculated and expressed as percentage. Not more than two of the tablets from the sample size ton deviate from the average weight by a greater

percentage and none of the tablets deviate from than double that percentage.

D) Hardness (Crushing strength)

The crushing strengths of tablets were determined individually with the Monsanto hardness tester, following 10 tablets were used and the mean crushing strength was calculated.

E) Friability

The friability of 10 tablets was determined using Roche Friabilator (Electrolab, Mumbai). This device subjects the tablets to the combined effect of abrasions and shock in a plastic chamber revolving at 25 rpm and dropping the tablets at a higher of 6 inches in each revolution. Preweighed sample of tablets was placed in the friabilator and were subjected to 100 revolutions. Tablets were dedusted using a soft muslin cloth and reweighed. The friability (F) is given by the formula;

$$F = (1 - W_o/W) \times 100$$

F) Disintegration time

The disintegration time of tablets was determined according to the method described in the British Pharmacopoeia

1998. Six tablets were placed in each compartment of the disintegration apparatus, with water thermostated at $37 \pm 1^\circ\text{C}$ as the medium. The tablets were considered to have passed the test after the 6 tablets passed through the mesh of the apparatus in 15 minutes.

G) Stability studies

The stability study of the formulated tablets was carried out at 45°C and 75% relative humidity using a stability chamber for 3 months²².

RESULT AND DISCUSSION

The primary objective of this work was to develop antihelminthic tablets from leaves of *Neolamarckia cadamba* and barks of *Alstonia scholaris*. The development of such herbal formulation will mark an important advancement in the area of phytopharmaceuticals. The present investigation examines formulation and evaluation of antihelminthic polyherbal tablets.

The prepared oral solid polyherbal formulation showed good elegance and palatability. All the parameters regarding the physico chemical like loss on drying at

105°C, water soluble matter, total ash and acid insoluble ash were within limits as per Pharmacopoeial specifications.

Table 2 shows that the physical properties of the granules, like bulk density, tapped density, angle of repose, Car's index and Hausner's ratio were found within the limits, which shows a good flowability of the granules. The angle of repose, Car's index and Hausner's ratio were found to be in the range.

The polyherbal antihelminthic tablets were evaluated for various parameters such as colour, average weight, hardness, friability and disintegrating time, which were found to be acceptable as per the pharmacopoeial

specifications. The hardness of the tablet was found to be between 4.1 ± 0.25 and 6.1 ± 0.27 kg/cm². The friability of the tablet was found to be below 1%, including a good mechanical resistance, and the disintegrating time of all the batches was found to lie in the range of 9.45 ± 0.58 and 14.07 ± 0.65 min. on the basis of various specification batch W5 was selected as the optimized batch.

Stability studies carried out on the final formulation W5 show no significant change in the physical parameters. There was a marginal change in hardness and friability while no change in thickness, weight and colour, showing that these changes were within the specified limits.

Table 1:

Composition of Herbal tablets prepared by wet granulation method

Ingredients (Mg)	W1	W2	W3	W4	W5	W6
Plant Extract	200	200	200	200	200	200
MCC	150	175	200	150	175	200
Lactose	120	85	50	120	85	50
PVP K30	20	30	40	-	-	-
Starch Paste	-	-	-	20	30	40
Mg. Stearate	5	5	5	5	5	5
Talc	5	5	5	5	5	5
Total Weight	500	500	500	500	500	500

Table 2:

Evaluation parameters of granules

Parameters	W1	W2	W3	W4	W5	W6
Bulk density (gm/ml)	0.523	0.554	0.564	0.555	0.521	0.743
Tapped Density (gm/ml)	0.598	0.585	0.577	0.586	0.535	0.761
Hausner's Ratio	1.1434	1.0559	1.0230	1.0558	1.0460	1.0242
Carr's Index (%)	12.5418	5.2991	2.2530	5.2901	2.6168	2.3653
Angle of Repose (°)	23.55	23.70	23.84	24.20	25.45	24.16
Moisture Content	3.0	3.2	3.0	3.1	3.0	3.4

Table 3:

Evaluation parameters of antihelminthic polyherbal tablets

Parameters	W1	W2	W3	W4	W5	W6
Colour	Yellowish Green					
Thickness (mm)	5.21 ± 0.02	5.22 ± 0.04	5.26 ± 0.03	5.23 ± 0.04	5.21 ± 0.01	5.28 ± 0.05
Weight variation test (mg)*	501 ± 1.12	502 ± 1.36	499 ± 1.23	503 ± 1.12	502 ± 1.22	501 ± 1.32
Hardness (kg/cm²)*	4.1 ± 0.25	5.6 ± 0.42	6.1 ± 0.27	4.5 ± 0.37	4.9 ± 0.53	5.7 ± 0.43
Friability (%)*	0.58 ± 0.02	0.51 ± 0.04	0.41 ± 0.03	0.60 ± 0.02	0.53 ± 0.01	0.49 ± 0.03
Disintegration time (minutes)*	9.45 ± 0.58	11.23 ± 0.45	13.47 ± 0.91	9.55 ± 0.33	10.45 ± 0.48	14.07 ± 0.65

Table 4:

Accelerated stability data of the formulated tablet

Parameters	Initial	1 Month at 45°C/75% RH	3 Month at 45°C/75% RH
Colour	Dark Brown	Dark Brown	Dark Brown
Thickness (mm)	5.21	5.21	5.21
Weight variation test (mg)*	501	501	501
Hardness (kg/cm²)*	4.9	4.8	4.8
Friability (%)*	0.53	0.54	0.53
Disintegration time (minutes)*	10.45	10.30	10.40

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