Research Article

Design and Comparative Evaluation of Albendazole Chewable Tablets

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ABSTRACT

Albendazole is a benzimidazole derivative with broad spectrum anthelmenthic activity and excellent tolerability. Orally it is rapidly absorbed and metabolized to sulfoxide and sulfone, which may be responsible for its anthelmenthic action. Single dose administration of albendazole has viz. produced cure rates in ascarisis, hookworm and enterobiasis which are comparable to three day treatment with Mebendazole. Albendazole chewable tablets (400 mg) were prepared by three methods Non Aqueous Granulation, Aqueous Granulation and Direct Compression and were in-vitro. Tablet prepared by these three methods were evaluated by different parameters such as Average Weight, Hardness, Carr's Index, Tapped Density, Friability, Disintegration, Content Uniformity Test, and Dissolution. All the parameters were found within the specifications. The study on the dissolution profile revealed that product 'DC had faster dissolution rate while compared to remaining batches and marketed product. Assay values were within the limits of 90% to 110%.

Keywords: Albendazole, Mebendazole, Granulation, Chewable tablets.

INTRODUCTION

Albendazoleisa benzimidazole derivative with broad spectrum anthelmenthic activity and excellent tolerability. Orally it is rapidly absorbed and metabolized to sulfoxide and sulfone, which may be responsible for its anthelmenthic action. Single dose administration of albendazole has produced cure rates in ascarisis, hookworm and enterobiasis which are comparable to three day treatment with mebendazole. It is described chemically as methyl [5-(propylsulphanyl) -1H-benzimidazol-2-yl] carbamate.

Administration of drugs through oral route is the most[1]common and the easiest way to administer a drug. But it is a challenge in children who have not yet learned to swallow tablets. Hence it was decided to formulate albendazole chewable tablet to improve the compliance in children. Chewable tablets are the tablets which are required to be broken and chewed in between the teeth before ingestion. These tablets are given to the children who have difficulty in swallowing and to the adults who dislike swallowing. The advantages of chewable tablets include palatability, stability, [2] precise dosing, portability and ease of delivery. The available literature suggests that chewable tablets provides a safe, well-tolerated alternative to traditional pediatric drug formulations and offer significant advantages in children with two years of age and above. In the present paper Albendazole chewable tablets were prepared[3-5] by three different methods and all the three batches were evaluated. The main objective of the present study was to formulate and evaluate Albendazole chewable tablet by different technique and to evaluate these using different parameters.

MATERIALS AND METHODS

Materials

Pure drug sample of Albendazole was procured from Arandy Laboratories Ltd. All other ingredients Lactose, Starch, Sodium starch glycolate, Isopropyl alcohol, Sodium Saccharine used were of pharmaceutical grade.

Manufacturing Procedures

Methods

Non aqueous Granulation

All the ingredients were separately weighed and sifted using mesh no. 40. Albendazole, Lactose monohydrate, sucrose was mixed in a poly bag for ten minutes. For the preparation of PVPK 30 binder solution, isopropyl alcohol was taken in a beaker, stirred with glass rod to disperse starch until dissolved. Then the above dry mixture was granulated with binder solution and dried in the tray drier at the temperature of 40-50°C until the moisture reduce down to NMT-2%. The dried granules were passed through mesh no. 30, Mannitol (Perlitol200) through mesh no. 30. Pineapple flavor were passed through mesh no. 60. All these were finally added to the dried granules and blended for ten minutes. The above blend was lubricated with Magnesium stearate, Talc, Aerosil for two minutes. The powder blends was evaluated for the flow properties and were found to be good. The evaluated b[6-7]lend was compressed into tablets to get tablets of 400 mg weight each. A minimum of two fifty tablets were prepared for each batch.

Aqueous Granulation

All the ingredients were separately weighed and sifted using mesh no. 40. Albendazole, Lactose monohydrate,

sucrose were mixed in poly bag for ten minutes. For the Preparation of sucrose binder solution purified water was taken in a beaker, stirred with glass rod to disolve until completely dissolved. Then the above dry mixture was granulated with binder solution and dried in the tray drier at the temperature of 40-50ºC until the moisture reduces down to NMT-2%. The dried granules were passed through mesh no. 30. Then Mannitol (pearlitol200) was passed through mesh no. 30, pineapple flavor were passed through mesh no. 60. All these were then added to the dried granules and blended for ten minutes. Finally the above blend was lubricated with Magnesium stearate, Talc, Aerosil for two minutes. The powder blend was evaluated for the flow properties and was found to be good. The evaluated blend was compressed into tablets to get tablets of 400 mg weight each. A minimum of two fifty tablets were prepared for each batch.

Direct Compression

All the ingredients were separately weighed and sifted using mesh no. 40. Albendazole, Lactose monohydrate, sucrose were passed through mesh no. 30. Mannitol (pearlitol200) Sodium starch glycolate and pineapple flavor were passed through 60 mesh and required quantities were blended for ten minutes in poly bag. Finally the above blend was lubricated with Magnesium stearate, Talc and Aerosil for two minutes. The powder blend was evaluated for the flow properties and was found to be good. The evaluated blend was compressed into tablets of 400 mg weight each. A minimum of two fifty tablets were prepared for each batch. The data is given in **Table 1**.

Physical Parameters of the Tablet	
Punch size	11.5mm
Punch shape	Round flat plain both sides
Weight of Tablet (mg)	400mg
Hardness(kg/cm^2)	NLT-3
Friability test (%)	NMT-1

Table 1: Manufacturing formulae

Method of manufacturing process	Non Aqueous granulation A1	Aqueous granulation A2	Direct Compression A3
Ingredient	**mg/Tablet**	**mg/Tablet**	**mg/Tablet**
Intra granular			
Albendazole	200.00	200.00	200.00
Lactose mono.	100.00	100.00	100.00
sucrose	55.00	50.00	60.00
Binder Preparation			
Sucrose		10.00	
Purified water	--	q.s	---
Polyvilnyl pyrolidone	5.00	--	--
Isopropyl alcohol	q.s	--	---
Extra granular			
Mannitol(perlitol SD200)	28.00	28.00	28.00
Talc	2.50	2.50	2.50
Aerosil	1.00	1.00	1.00
Pineapple flavor	1.50	1.50	1.50
Magnesium stearate	2.00	2.00	2.00

Evaluation of Tablets

Weight Variation

Twenty tablets were selected at a random and average weight was determined [8-10]. Then individual tablets were weighed and was compared with average weight and minimum percentage deviation were determined.

Hardness Test

Hardness or Tablet crushing strength (Fc), (the force required to break a tablet in a diametric compression) was measured using Monsanto hardness tester. This test was done for five tablets and the average value was recorded.

Tensile Strength

The Tensile Strength (T) of the tablets was calculated using the following formula

$$T = 2Fc/\pi dt$$

Where,

Fc, d and t denote crushing strength, diameter and thickness of the tablet respectively.

Friability Test

Friability of tablets was determined using Roche friabilator. This device subjects the tablets to the combined effect of abrasions and shock in a plastic chamber revolving at 25 rpm. Pre weighed 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,

$$f = (1-W_O/W)100$$

Where,

w_o= weight of the tablet before the test

w=weight of the tablet after the test.

Disintegration Test

For a drug to be absorbed from a solid dosage form after oral administration, it must first be in solution, and the first important step toward this condition is usually the break -up of the tablet, a process known as disintegration. The disintegration test is a measure of the time required under a given set of conditions for a group of tablets to disintegrate into particles which will pass through a 10 mesh screen. The disintegration test is carried out using the disintegration tester which consists of a basket rack holding 6 plastic tubes, open at the top and bottom, the bottom of the tube is covered by a 10-mesh screen. The basket was immersed in a bath of suitable liquid held at 37ºC, preferably in a 1L beaker. For compressed uncoated tablets, the testing fluid was usually water at 37^{oC} but some monographs direct that simulated gastric fluid be used. If one or two tablets fail to disintegrate, the test was repeated using 12 tablets.

Drug Content

Five Tablets were powdered and the blended equivalent to 200 mg of Albendazole was weighed and dissolved in suitable quantity of water. The solution was filtered, suitably diluted and drug content was analysed Spectrophotometrically at 307 nm. Each sample was analyzed in triplicate. The data is given in **Table 2**.

Table2: Comparative Evaluation of Tablets

Parameters	Tablets code			
	A1	A2	A3	Marketed
Weight of tablet (mg) ±S.D	4000±0.23	398±0.33	400±0.12	398±0.17
Hardness(kg/cm^2) ±S.D	5.0	5.1	6.0	5.2
Friability test (%)	0.19	0.18	0.16	0.17
Drug content (mg)	99.85	99.75	99.95	99.8
Assay (%)	100	99	99	99
Dissolution time cumulative % of drug dissolved in 60min	93	85	99	93
Disintegration time(min)	10	9	8	11

Taste Evaluation

The healthy human volunteers were used for taste masking and informed consent was obtained from all of them. Bitterness of tablets was measured by consensus of a trained taste panel by holding in the mouth for few minutes. Then spat out, the acceptability level was then recorded. A numerical scale was used with the following values: 1=Good, 2=Fair and 3= Poor. The data is given in **Table 3**.

Table 3: Taste Evaluation and Over All Acceptability of Formulations

Formulation code	Volunteer										Over all acceptability		
	1	2	3	4	5	6	7	8	9	10	1	2	3
A1	3	2	2	3	2	2	1	2	2	1		√	
A2	2	1	3	1	2	2	2	3	3	3			√
A3	1	1	1	1	1	1	1	1	1	1	√		

RESULTS AND DISCUSSION

All The prepared batches of tablets were within the range. Using Monsanto hardness tester, the strength of the tablets was tested. All the tablets showed good hardness. The friability was carried out for all the batches of tablets. The friability was less than 0.2% for all the blends and was satisfactory. Assay value of all prepared batches of Albendazole tablets were within the range of 90%to 110% of stated amount of Albendazole. From the data obtained it was found that 99% of drug was released for the trial 'A3' at 30 min while other trials 'A1'& 'A2 had shown 93% & 85% drug release at 30 min respectively. The dissolution profile of batches of tablets prepared by direct compression method has shown better results compared to the tablets prepared by other methods as well as marketed product as showed in **Fig.1.**

CONCLUSION

All the products have given the satisfactory results with respect to hardness, friability, assay and in vitro dissolution. The batch 'A3'i.e prepared by direct compression method had the better dissolution rate when compared to batches 'A1'and'A2' prepared by non aqueous and aqueous methods respectively.

1-Good, 2-Fair, 3-Poor

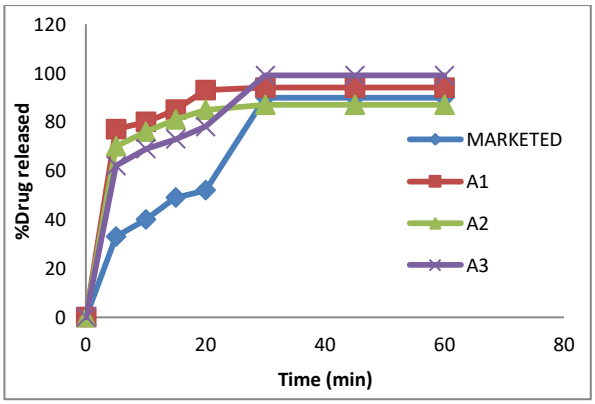

Figure 1: Comparison of Dissolution Profiles of Three Batches of Tablets and Marketed Product

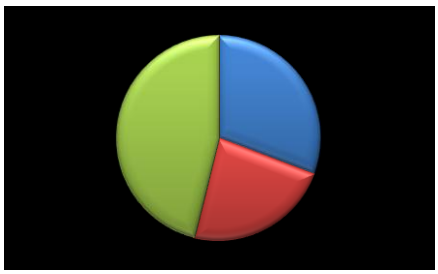

Figure 1: Evaluation of Acceptability of Tablet Formulations. [A1-Blue (Fair), A2-Pink (Poor), A3-Green (Good)]

The study conclusively demonstrated the bountiful benefits of increased solubility and dissolution rate, rapid onset of action, and a positive impact on the patient compliance.

All the three batches of tablets were found to have tolerable and acceptable taste. These were confirmed by all the volunteers and were denoted in the **Fig.2**. A3 formulation was confirmed to have good taste by taking in to consideration the average of the opinion of all the volunteers.

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