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Evaluation of binder's efficiency of different natural gums in tableting process

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ABSTRACT

The prime importance of granulation is to improve the flow properties of the powder properties and its compression properties. To form granules bond must be formed between the particles so that they will adhere with each other with sufficient strength. Granulating agent, which aid drug and excipient aggregation, are a function of the binder type, the physical properties of the drug and the processing methods. This work is to evaluate the physical properties of the granules, the tableting performance and the physical characteristics of the tablets by the use of gum tamarind and comparison with the established binders which prove the binding efficiency of the gum tamarind. The results suggest, due to the high binding capacity of the tamarind gum the characteristics of the granules and tablet are better than the other and for its lower cost and easy availability in the market the gum can be a binding agent of choice.

Key words: Tamarind seeds, binding agent, granulation, flow properties, binding efficiency.

INTRODUCTION

Most of the pharmaceutical Powders are not easily compressible, don't flow well, are too fluffy hence the powder particles need to be combined and attached using pharmaceutical glue called a binder. When the binder is put into water or a solvent solution and is mixed with the powders this process is called "The wet granulation process". The binder forms bonds between particles which are maintained even after the solvent is dried. In recent years many different types of natural binders are used. In pharmaceutical industries they are used as binders, thickening agent, emulsifiers, film formers and suspending agents [1]. India due to its geographical and environmental positioning has traditionally been good source for such products.[2-3]. Tamarind plants are widely available in dry tracks of central and south India. Tamarind gum contains protein, oil, crude fiber, non fiber carbohydrates, ash; all were measured on a dry basis [4]. It is used in cotton industry, microbial production of lipids [5], and paper manufacturing. It can be used as an effective alternative for the formulation of pharmaceutical emulsions [6]. Similarly

Hibiscus rosa-sinensis leaves mucilage appears to be suitable for use as a release retardant in the manufacture of sustained release matrix tablets because of its good swelling, good flow rate and suitability for matrix formulations [7].

Powders are mixed and granules of uniform size are formed by the addition of binder. The strength of agglomeration differs to the binding efficiency of the binder. The aim of this work was to evaluate the binding efficiency of different natural binders incorporated in different processes by comparing the physical properties of the granules, tableting performance and the physical characteristics of the tablets.

MATERIALS AND METHODS

The materials used include tragacanth, acacia (S.D.Fine chemicals, Mumbai). Tamarind seeds were collected from the local market.

Preparation of tamarind gum

The tamarind seeds were washed several times with warm distilled water to remove any extra pulp. The seeds were than fried on hot sand inside a stainless steel container and allowed to cool. The fried seeds were crushed with the help of a mechanical device to remove the outer covering of the seeds and the fried seeds were boiled in a glass container containing distilled water and the thick slurry was collected. The slurry was dried at 50°C in a hot air oven on a stainless steel plate. The dried film of the gum was collected, grinded and stored in an air tight container (TAM 1). The same process was also adopted to obtain gum from raw seeds (without frying) (TAM 2).

Formulation of tablet

The materials used for tablet preparation were fine crystalline lactose and corn starch in a 4:1 ratio. In the first experiment, a solid mixture was prepared comprising the crystalline lactose, corn starch and the gum (5%) and water was used as the granulating liquid. The water was added to the mixture by the use of a hand sprayer with intermittent mixing. In the second experiment a binder solution was added at a volume corresponding to the same amount of water used in the first method. The final granules so obtained were evaluated for particle size distribution, granule shape, flow properties, friability, bulk density, tapped density and moisture content. Tablets were prepared by compression of the granules lubricated with 0.5% magnesium stearate and 2% dried talcum using a single punch press (cadmach) and were evaluated for average weight, weight variation, hardness, friability, thickness and disintegration time.

Table 1- Physical characteristics of the granules

Parameters	Trag /H_2O	Trag Sol^n	Acacia/ H_2O	Acacia Sol^n	Tam1/ H_2O	Tam1 Sol^n	Tam2/ H_2O	Tam2 Sol^n
Residual moisture %	1.60	1.72	1.65	1.80	1.84	1.83	1.93	1.92
Carr index %	18	16	17	15	12	10	11	10
Average granule size µm	149	200	138	180	210	280	265	320
Repose angle in deg	30	32	38	34	32	36	35	34

Table 2- Physical characteristics of the tablets

Parameters	Trag/ H_2O	Trag Sol^n	Acacia/ H_2O	Acacia Sol^n	Tam1/ H_2O	Tam1 Sol^n	Tam2/ H_2O	Tam2 Sol^n
Average Weight, mg	0.114	0.113	0.112	0.114	0.114	0.113	0.113	0.114
Hardness, Kg/Cm^2	2.0	2.2	2.4	2.6	3.0	3.8	3.5	4.8
Friability, %	0.35	0.30	0.26	0.20	0.16	0.12	0.14	0.10
Disintegration Time , Min	10	12	15	18	20	25	23	35

RESULTS AND DISCUSSION

In the present study, from the physical characteristics of the granules it was observed that the granules obtained from tamarind gum were stronger than the other two natural gums. Similarly the granules strength and flow property were better in case of tamarind gum prepared from the raw seeds.

In addition to the above observation by comparing the tablet characteristics, the hardness and friability were better but the disintegration time was more in case of tamarind gum prepared from raw seeds. This proved the excellent binding efficiency of the tamarind gum prepared in either methods comparing acacia and tragacanth.

CONCLUSION

The tableting process of all the formulation did not put any problem and the tablet produced showed properties depending on the granules characteristics. Tablet prepared from tragacanth were softer than acacia and gum tamarind and it was also observed that the granules binding capacity was more in case of Tam 2 as compared with Tam 1 and others. All the results were good but in case of Tam 2 some compromise is to be taken in the gum concentration to prepare the tablets of required specification.

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