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COMMUNICATION

AN EVALUATION OF STARCH OBTAINED FROM PEARL MILLET - Pennisetum typhoides. AS A BINDER AND DISINTEGRANT FOR COMPRESSED TABLETS

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ABSTRACT

The binding and disintegrant properties of millet starch obtained from Pearl Millet - Pennisteum typhoides (Staph. Burn. and Hubb.) Fam. Gramineae have been evaluated using tablet formulations of four drugs.

The results showed that Millet starch compared favourably with Maize starch with regards to most of the parameters used to evaluate the tablets. It can be safely concluded that millet starch is suitable for use as a binder and disintegrant in tablet formulations.

INTRODUCTION

Starch is a naturally occuring substance of wide distribution and an important adjuvant in the formulation and production of tablets. Starches derived from

wheat, rice, corn (maize) and potato have been accepted by the British Pharmacopoeia and are used in tableting as diluents, binders, disintegrants and lubricants.

Several workers[1,2,3,4] have investigated various starches for their binding and disintegrant properties.

Pearl millet, a cereal grain, is an important food crop that is extensively grown in the savannah and sahel regions of Nigeria. Work on millet starch as tablet excipient has not been reported in the literature. In this study, we have extracted starch from millet grains and compared its properties as a tablet binder and disintegrant with those of maize starch B.P.

MATERIALS

Sulphadimidine and Maize starch B.P. (M & B, Dagenham, England), Chloroquine phosphate (Bayer, India LTD.), Calcium carbonate, Sodium bicarbonate and Talc (BDH chemicals Ltd., Poole, England), Magnesium stearate (Hopkin & Williams Ltd., Essex, England), and millet starch prepared in our Laboratory.

METHODS

Preparation and Analyses of Millet Starch

The prime white starch was obtained from the millet (seeds) grains after it has been wet-milled, ground in a blender, centrifuged and filtered several times. The particle size of the millet starch was determined by optical microscopy.

Formulation studies

Four drugs; calcium carbonate 500mg and sodium bicarbonate 500mg - inorganic, insoluble and soluble drugs, sulphadimidine 500mg and chloroquine phosphate 250mg - organic, insoluble and soluble drugs respectively were used in the formulation of tablets.

Starch paste (10% w/w) was used as binder for all the formulations, while 10% w/w and 5% w/w dry starch were used for the insoluble and soluble drugs respectively as disintegrant. 0.25% w/w of a (1:1) Talc and Magnesium stearate mix was used as lubricant for all the formulations except the chloroquine phosphate formulations where 1% w/w of the lubricant was used.

The wet granulation method by massing and screening was used for the granulation with half the starch as internal disintegrant. The granules were dried in a hot air oven, at 40 ^{o}C for 4 hours.

Analyses of the Granules

The Erweka Granule Flowability Tester was used to determine the flowability of the granules. The tapped and bulk densities of the granules were also carried out. The particle size distributions of the granules were measured by sieve analysis.

Compression of Tablets.

Granules of size range 150um - 1.00mm were compressed into tablets using suitable punches and die sets.

Evaluation of Tablets

The hardness, friability and disintegration time of all the tablets were carried out immediately after compression. The dissolution rates of the organic drug tablets were also determined. Similar tests were also carried out on the tablets after 3 months of storage.

RESULTS AND DISCUSSIONS.

The size of the millet starch particles ranged from 4.2 - 14.7um with a mean of 8.8um.

Granules made from both starches had similar flow rate, tapped and bulk densities. All the granules had good flowability.

The mean hardness and friability values of tablets made from both starches before and after storage were similar. The disintegration time results showed that tablets produced with millet starch had shorter disintegration times than those produced with maize starch. This seems to suggest that the millet starch has a better disintegrant property than the maize starch as similar quantities of the starches were used in the formulation.

The dissolution profiles of tablets were basically similar for all starches and drugs. The T50 values were rapid and shorter for the millet starch tablets than those formulated with maize starch. There was a direct correlation between the disintegration time and the time required for 50% of the drug to dissolve.

There were slight decreases in the mean hardness of all the tablets after 3 months of storage. This may be due to the high relative humidity of Zaria within the period of rainy season. The friability values also increased slightly, apparently due to the decrease in hardness. There were no significant changes in the disintegration times and the dissolution rates of all the tablets after 3 months of storage.

CONCLUSIONS

From the parameters studied, Millet starch has been found to be suitable in tableting as binder and disintegrant. The millet starch compared favourably with maize starch with respect to the physical properties of the granules and tablets including the rate of dissolution of the active ingredients for the organic drugs. The tablets did not change significantly on storage, and the drug release was found to be the same.

REFERENCES

1. R.P. Patel and G.J.Joshi, Indian J.Pharm.21,136 (1959).
2. R.N. Nasipuri, Pharm. Acta. Helv.54, Nr.2, 48 (1979).
3. S. Esezobo and V. Ambujam, J. Pharm. Pharmacol. 34, 761 (1982).
4. A.V. Deshpande and L.B. Panya, J. Pharm. Pharmacol. 39, (6), 495, (1987).