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PRELIMINARY EVALUATION OF CISSUS ROOT GUM AS A BINDER IN SODIUM SALICYLATE TABLET FORMULATIONS

A. Chukwu and P. Okpalaezinne
Department of Pharmaceutical Technology and
Industrial Pharmacy, University of Nigeria, Nsukka.

ABSTRACT

Cissus root gum was processed and evaluated as a binder in lactose-based tablets each containing 100 mg of sodium salicylate as the active ingredient. Acacia binder was used as basis for comparison. Tablet hardness, friability, disintegration time and dissolution rate were the parameters investigated. The cissus gum gave hard and non-friable tablets at 1 - 3% $^{w}/_{w}$ concentration of the tablet formula. Tablets containing above 2% $^{w}/_{w}$ of the cissus gum gave high disintegration time values and the pattern of dissolution of the incorporated drug suggests that the gum may be useful in prolonged release tablet formulations. No significant changes in the tablet properties was observed after storage at 30°C for 16 weeks.

INTRODUCTION

Cissus plant of the amphelideae family grows wildly in the forest areas of Southern Nigeria. The fibrous roots are harvested, cut into smaller pieces, washed thoroughly in water and dried under the sun. Few grams of the cut roots when soaked in cold water produce copious, very thick and slippery mucilage. The dried roots when pulverised are used by some women as a thickner in soup. Because of the high yield, cheapness and ease of cultivation of the plant, the root gum was selected for study as a potential tablet binder. Natural gums such as guar and xanthan

gums are known to have important applications in pharmaceutical, cosmetic and food industries.

The parameters used for evaluation in this study were tablet hardness, friability, disintegration time and dissolution rate previously reported by some authors (1,2,3). Sodium salicylate was used because of the ease of analysis.

MATERIALS

Sodium salicylate[1], lactose[2], corn starch[2], magnesium stearate[3], acacia powder[4], and 95% $^{v}/v$ ethanol[4] were used as procured from the manufacturers.

METHODS

Extraction of the gum

A 100 g quantity of the cut pieces of the fresh cissus root was washed several times in water, rinsed with distilled water and then soaked in 500 ml of distilled water in a stoppered one litre conical flask for 24 h. The thick and slimy mucilage obtained was strained through a 150 μm stainless steel sieve[5] and centrifuged[6] for 25 min. The gum was precipitated with 95% $^{v}/v$ ethanol, washed several times with ethanol and then dried in a desiccator.

Preparation of tablets

The tablet formula consisted of 26% $^{w}/w$ sodium salicylate powder, 64% $^{w}/w$ lactose, 8% $^{w}/w$ maize starch disintegrant and 1% $^{w}/w$ magnesium stearate lubricant. The conventional wet granulation technique was used. Three batches of granules were prepared to contain 1%, 2% and 3% $^{w}/w$ cissus gum binder respectively. In each batch, enough powders were mixed to yield 500 tablets. The damp mass was passed through a 1.7 mm sieve and dried at 60°C in a hot air oven. The dried granules were passed through a 1.0 mm sieve and the fines separated by shaking through a 0.25 mm sieve. The fines, which in each case was fixed at 15% $^{w}/w$ was suitably mixed with the coarse granules and the lubricant in a prototype

roto-mixer. The total time of mixing was five minutes. An F-3 single punch tabletting machine[7] fitted with 9.5 mm diameter flat-faced punches was used for compression. In each case the compressional pressure was fixed at 49 kgf. The same procedure was repeated for the formulations containing acacia gum as binder.

Evaluation of tablets

The mean hardness values for twenty tablets selected randomly from each batch was determined[8]. The friability test was carried out by using twenty dedusted tablets in each case. A friabilator[9] set at 25 rpm for 4 minutes was used. The USP 1980 disintegration method was adopted using a suitable disintegration unit[10]. The dissolution rate test was done using a dissolution apparatus[11] maintained at 37 ± 1°C. The dissolution medium was 0.1 N HCl. Samples of the dissolution medium were withdrawn at predetermined time intervals, then treated with 2 ml of freshly prepared ferric chloride solution and the absorbance was read at 540 nm in a spectrophotometer[12]. The average absorbance was determined in each case and the corresponding concentration was calculated from a standard Beer's plot.

RESULTS AND DISCUSSION

The mean hardness values, friability and disintegration times of the various batches of tablets containing either acacia or cissus gum as binder are presented in Table 1.

Generally, good hardness values were obtained for each binder type and concentration level investigated. Although the mean hardness values for tablets containing cissus gum are slightly higher than those containing acacia gum at similar binder concentrations, no significant difference exists between the two mean values except at 3% $^{w}/_{w}$ where the cissus binder yielded significantly harder tablets. In terms of friability, 2 - 3% $^{w}/_{w}$ of each of the binders yielded acceptable tablets. At each binder concentration, the disintegration time of tablets containing cissus gum were found to be higher than those containing

TABLE 1

Some Physical properties of Sodium salicylate Tablets containing 1 - 3% w/w acacia or cissus binders

Binder (% w/w)	Mean hardness (kgf)		Friability (%)		Mean disintegration time (min)	
	Acacia	Cissus	Acacia	Cissus	Acacia	Cissus
1	6.15	6.22	1.14	1.03	5.8	6.60
2	6.19	6.25	0.81	0.69	6.04	12.50
3	6.25	7.93	0.70	0.45	6.38	27.31

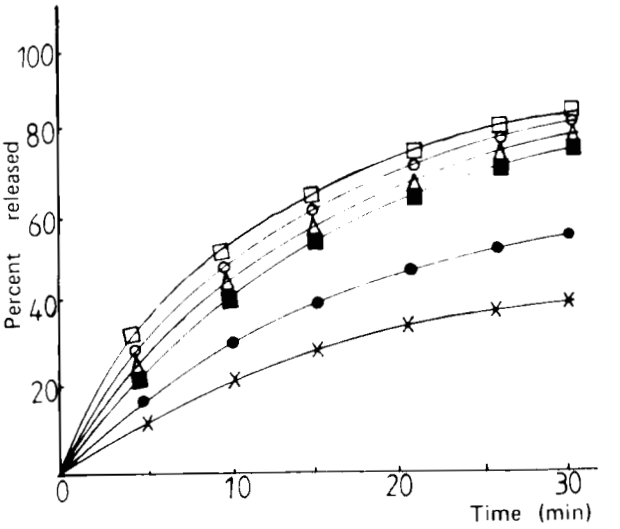

FIGURE 1

Dissolution profile of sodium salicylate from tablets containing acacia and cissus binders. Acacia □ 1% w/w, ○ 2% w/w, Δ 3% w/w; Cissus ■ 1% w/w, ● 2% w/w, X 3% w/w.

acacia gum. From the results obtained, the indication is that cissus gum may act as a useful binder at concentrations less than 3% $^{w}/_{w}$ of the tablet formula. However, the gum has to be evaluated in different tablet formulations.

Figure 1 shows the dissolution profile of the sodium salicylate from the various batches of tablets produced. Tablets containing acacia binder released the drug faster than those containing cissus gum. For example, the t_{50} values were found to be 10 min and 25 min for tablets containing 2% $^{w}/_{w}$ acacia and cissus gums respectively. The t_{50} for tablets containing 3% $^{w}/_{w}$ acacia was 11.4 min whereas after 30 min only about 35% of the drug was released from tablets containing equivalent amount of cissus gum. The delayed release observed in this case may be attributed to the high disintegration time of 27.3 min observed for this batch of tablets. Gums have since been known to prolong drug release when incorporated beyond an optimum concentration due to gel barrier formation within the tablet (4).

CONCLUSION

Cissus gum, used as a thickner in soup by some poor women in the forest areas of Nigeria may be processed to a pharmaceutical grade excipient for use in tabletting. It has been found to compare favourably with acacia binder in sodium salicylate tablets. The relatively delayed release profile observed for the tablets containing cissus gum indicates that it has to be incorporated in small amounts when used as a binder. Also, the gum may find use in the formulation of prolonged release dosage forms. The physico-chemical properties of the gum and its emulsifying and suspending properties are being studied and will constitute separate reports.

FOOTNOTES

1. Fluka A G
2. May and Baker
3. BDH
7. Manesty
8. Stokes-Monsanto
9. Erweka TAR

4. Merck
5. Endecotts
6. MSE major
10. Erweka ZT-4
11. Erweka DTD
12. Pye Unicam SP6-450

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