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Effect of Xanthan/Locust bean gum synergy on ibuprofen release from hydrophilic matrix tablets

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Hydrophilic matrix (HM) tablets have been shown to be an effective means of achieving sustained release of oral medication (Alderman 1984). The majority of studies have investigated drug release from tablets containing single polymers. This study examines the relationship between drug release and the rheological properties of two polymers, xanthan and locust bean gum, which when mixed, display significant rheological synergy.

The rheological behaviour of cold-mixed 1% w/w solutions in 0.1M NaCl was analysed using a Rheometrics materials spectrometer 7800 fitted with Couette geometry R1/R2= 0.92. Fig.1 shows that whilst there was no significant effect on the viscous component (G"), significant increases in the elastic component (G') were observed, with maximum synergy occurring at a polymer ratio of 70:30. This indicates that mixing the two polymers results in significant increases in gel strength but not in viscosity.

HM tablets (600mg, 12 mm diameter, 9-10kp strength) were prepared containing 5% polymer, 33% ibuprofen and 1%w/w magnesium stearate in microcrystalline cellulose. Drug release profiles were determined in a USP apparatus 1 at 100 rev.min.$^{-1}$ in pH 7.5 phosphate buffer. Fig. 2 shows that polymer mixtures exhibited significantly slower drug release rates than xanthan or locust bean gum alone, with the greatest prolongation of release occurring at the polymer ratio corresponding to the greatest rheological synergy. Values of G' were found to be linearly related to the time for 50% drug release ($r= 0.998$, $p<0.01$) suggesting that in this mixed polymer HM system, release is modulated by the gel strength rather than by the viscosity of the surface gel layer. This suggests substantial release of ibuprofen by an erosion mechanism. The results show that xanthan / locust bean gum combinations provide significantly slower release rates than xanthan gum alone, and that the release profile is dependent on the ratio of polymers used.

Alderman, D.A. (1984) Int.J.Pharm.Technol.Prod.Mfr.5:1-9

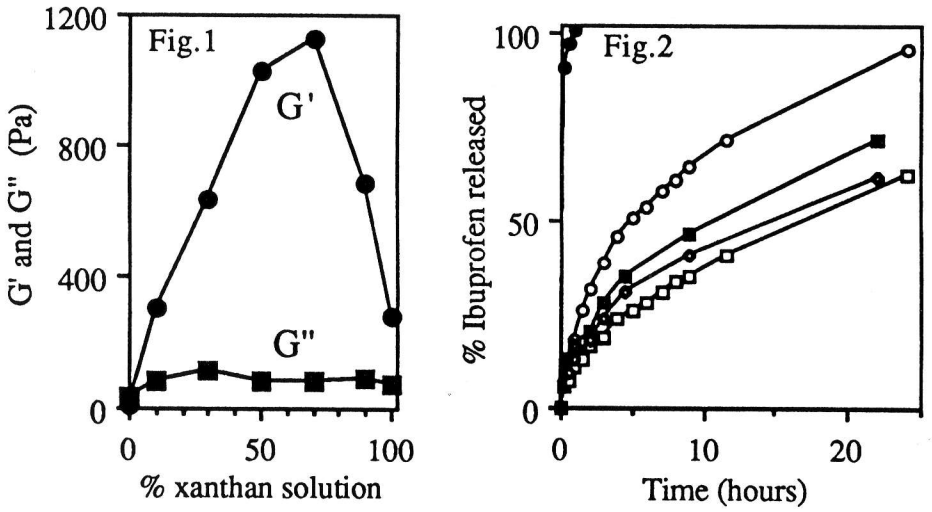

Fig.1. Storage (G') and loss (G") moduli of 1% mixed solutions of xanthan and locust bean gum at 37°C and 1 rad/s.

Fig.2. Release profiles of ibuprofen from HM tablets containing different ratios of xanthan and locust bean gum ○ (ratio 10:0), ■ (9:1), ❑ (7:3), ◆ (5:5), ● (0:10).

Polymer ratio (xanthan:LBG)	Storage modulus G' (Pa)	Time for 50% drug release (hours)
10:0	282	4.83
9:1	685	10.67
7:3	1125	16.37
5:5	1025	14.52

Table 1. Storage moduli and time for 50% drug release for HM tablets containing different ratios of xanthan and locust bean gum (LBG).