WET MASS SHEAR STRENGTH AND TABLET DISSOLUTION

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The experiments described here relate the unconfined undrained shear strength (c_u) of the wet mass to massing time in an attempt to explain the apparent dependence of dissolution rates on massing time described by Tiamraj & Dingwall (1978).

200 parts (by weight) crystalline lactose (Whey Products, type 30A mean particle size 150μm) were mixed with 1 part erythrosine (BDH) in a ribbon mixer, then 1.5 kg lots of this dry powder mix were massed in a ZZ mixer (Duplex, 00 Morton Machines) with 240 g 10% w/w starch mucilage. At the end of the massing time the whole batch was removed, a 900g sample taken for shear testing and the remainder passed through a 1000μm mesh sieve on an oscillating granulator(Jackson -Crockatt No. 6). These granules were tray dried, resieved (2000μm mesh) and after addition of 5% w/v dry potato starch and 1% w/w magnesium stearate compressed 10 kNm^{-2}) on an instrumented Leyman WL tablet machine into 9.5mm diameter tablets (mean weight 320 mg). Dissolution time of the tablets was determined by a previously described method(1). Results are expressed as t_{50} (the time required for 50% erythrosine release).

c_u for 3" x 1.5" cylinders of wet mass was calculated from the results of a triaxial compression test (Akroyd 1957) on a Wykeham Farrance Ltd., test apparatus with a No. 5451 proving ring, at five different cell pressures. Six different massing times were used, 3, 6, 9, 15, 21 and 30 min. Results of dissolution tests and shear strength measurements are shown in Table 1.

Table 1. Variation of wet mass shear strength (c_u) and tablet dissolution (t_{50}) with massing time.

Massing time (min)	c_u(kNm^{-2})	t_{50}(min)
3	59.5	49.3 ± 4.4 (12)
6	51.5	34.9 ± 6.4 (12)
9	42.5	26.6 ± 6.0 (12)
15	34.5	23.3 ± 4.5 (8)
21	32.1	18.8 ± 3.5 (12)
30	32.7	21.9 ± 2.6 (8)

t_{50} values are the mean of n determinations, in brackets, $\pm$ standard deviations.

c_u of the wet mass was found, like t_{50} to decrease with massing time until about 21 min when it seemed to become independent of massing time. Several parameters are however involved in shear strength of a wet mass e.g. particle size and shape water content and type of interparticle forces involved and it is not easy to isolate any one of these as the cause, in this case, of the initial inter-dependence of shear strength and massing time. The results however show that for this system at least one could use the shear strength of the wet mass as an indicator of dissolution behaviour of tablets made from the mass.

Tiamraj, T. & Dingwall, D. (1978) Manufacturing Chemist & Aerosol News,49 43-49.
Akroyd, T.N.W. (1957) Laboratory Testing in Soil Engineering, Soil Mechanics Ltd. England, pp. 80-108.