3. Ramberg, H., *Chicago Univ. J.*, Chicago Press, 1952, 252.
4. Read, H. H., *Min. Mag.*, 1933, 23.

STUDIES ON EQUILIBRIUM RELATIVE HUMIDITY (E.R.H.) FOR ONION POWDER

DURING the course of our investigation on the dehydration of onions, a survey of literature revealed little published information on the packaging requirements or the *Equilibrium Relative Humidity* (E.R.H.) data on onion powder. The present report covers this important aspect of packaging of onion powder.

Onion powder freshly prepared at this laboratory was employed for E.R.H. studies by the Wink's weight equilibrium method.[1] Nine lots of onion powder (5 g. each) were accurately weighed into 9 flat-bottomed metallic dishes and exposed to nine different relative humidities[2] ranging from 5 to 90% at 25-26° C. The gains or losses in weights of different lots of onion powder were determined after 1, 2, 4, 8 and 24 hours and followed up every 24 hours till the moisture equilibrium of the product was obtained at each relative humidity. The relationship between the equilibrium moisture content and the number of days the product took to reach equilibrium at a particular relative humidity at 25-26° C. is presented in Table I. The changes in the texture and general condition of onion powder (Table II) with particular reference to caking and colour during the course of the experiment were employed for determining the critical and danger points for onion powder. A sample was considered as *'caked'* if a sharp rap on a wooden surface failed to loosen the powder in the dish.

TABLE I

Relation between equilibrium moisture content, relative humidity and time for equilibrium in onion powder

Per cent. relative humidity	Equilibrium moisture content %	No. of days to reach equilibrium
5	6·44	3
10	8·62	5
15	9·54	5
20	11·18	5
30	14·19	6
40	17·42	8
50	21·58	8
70	33·30	13
90	Mould attack visible on the 8th day (Moisture—62·46%)	..

TABLE II

Effect of moisture level on the texture and general condition of onion powder

Moisture	Texture and general condition of onion powder
4·02	Free flowing
5·18	Tendency to granulation
6·44	Granulation
7·50	Slight caking
8·39	Caking
9·54	Slightly wet caking
11·18	Wet caking
14·19	More wet caking
17·42	Pasty consistency and slight darkening
21·58	Pasty and slight darkening
33·08	Very pasty, slightly darkened
62·46	Mould growth

Onion powder was found to be highly hygroscopic, picking up moisture even at 10% relative humidity, it being even more hygroscopic than garlic powder.[3] Further, unlike garlic powder,[3] mould attack was noticeable in onion powder stored at 90% R.H. (Table I). Based on the sorption isotherm (Fig. 1), for a typical onion powder (about 4% moisture), the equilibrium relative humidity would be somewhat less than 5%. To keep the powder free-flowing it is, therefore, essential to handle (detraying, milling and packaging) it in a room of low humidity (about 5%) which will avoid any material moisture uptake during handling. From caking view-point, the critical point for onion powder would be at 8·39% moisture level. For a typical free-flowing onion powder, the optimum moisture level would be about 4%.

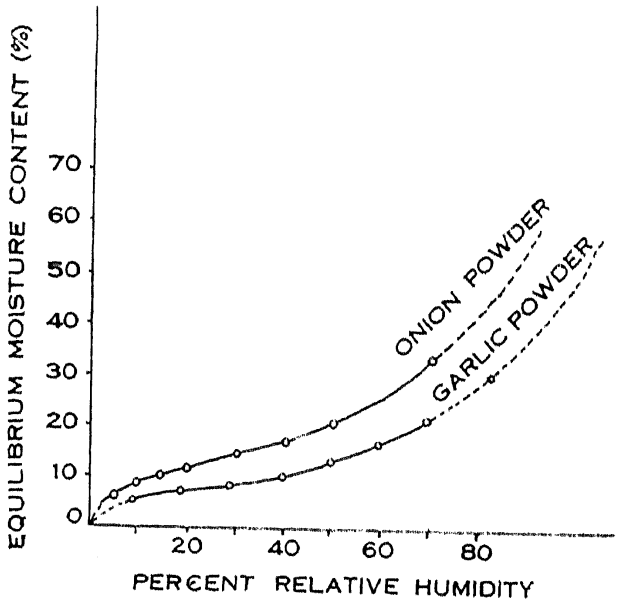

FIG. 1. Sorption isotherm for humidity moisture equilibrium curve for onion powder at 25–26° C.