

AIR RELATIVE HUMIDITY EFFECT ON DRYING KINETICS OF LAMBERTIN APRICOTS

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OBJECTIVES

Study of the effect of air relative humidity (RH) on convective drying kinetics of apricots.

INTRODUCTION

- Air temperature and velocity are the most studied basic parameters that affect drying kinetics (Piotrowski and Lenart, 1999).
- There are few research works about the influence of air relative humidity (RH) on drying kinetics.
- *Literature Review :*
 - The effect of air humidity is basically on the final equilibrium moisture content (McCabe et al., 1993; Madamba et al., 1996).
 - The influence of air humidity on food drying is statistically insignificant (Madamba et al., 1996; Daudin and Bimbenet, 1985; Kiranoudis et al., 1997).
 - The air humidity is a factor to consider. Sabarez et al. (1997) concluded that air humidity highly affects the initial drying rate and drying time of plums, and Yusheng and Poulsen (1998) verified that it has a great effect on drying rates, and some effect on activation energy.

MATERIALS & METHODS

- Lambertin apricots (*Prunus Armeniaca*)
- refrigerated at 4°C and 80% RH
- cut in half and pre-treated with SO₂ 5% plunged 5 min in 2L of solution
browning prevention

• Pilot plant tray dryer :

- forced air
 ↳ controlled temperature and air velocity

• Recirculation of the air :

- adapted air duct to the dryer inlet and outlet
- ultrasonic humidity generator / water deionizer / humidity probe
 ↳ controlled air humidity

• On-line acquisition of :

- total weight ↳ digital balance
- air temperature and RH ↳ datalogger



Fig. 1 - Pilot plant tray drier (Armfield UOP8).

• Convective Drying Experiments :

40°C temperature	25.3%	} mean RH
0.60 m/s air velocity	32.6%	
	42.1%	
	51.6%	

• Sorption isotherms :

water activity measurements

- ↳ Rotronic Hygroskop DT
- ↳ Temperature controlled water bath, 40°C

- water content determination (initial and final)

RESULTS & DISCUSSION

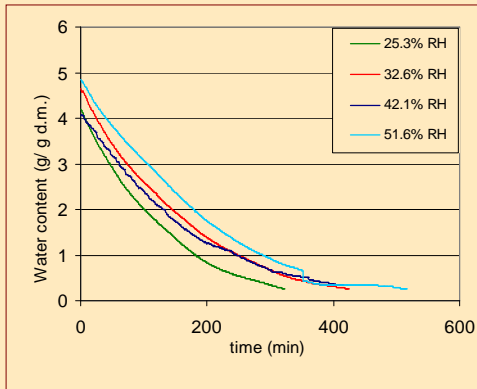


Fig. 2 - Drying curves at different air humidities.

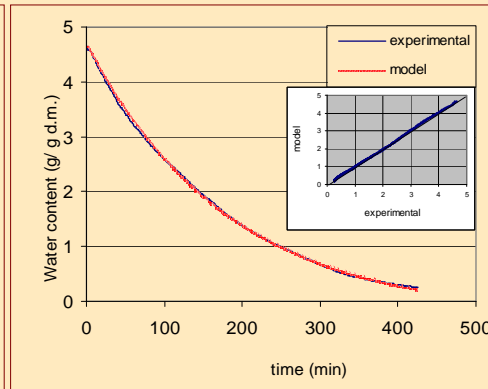


Fig. 3 - Example of experimental data and fit.



- Fit to the Exponential model (Newman et al., 1996):

$$\frac{M - M_e}{M_o - M_e} = \exp(-Kt)$$

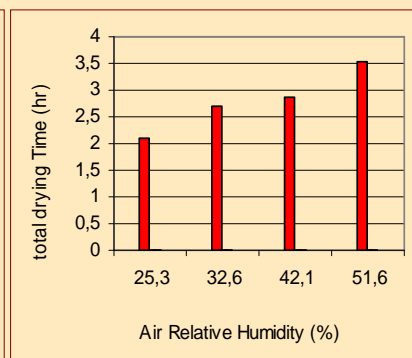
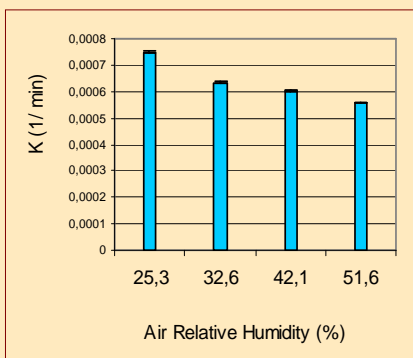


Fig. 4 - Drying rates and total drying times at different air humidities.

$$K \propto \frac{1}{RH}$$

CONCLUSIONS

- Besides influencing the final equilibrium moisture content, RH also affects the drying rate constant.
- RH affects drying rate to a lesser extent than air temperature. But, on the other hand, RH has a great influence on total drying time.
- Implication : For instance, in solar drying it is essential to keep low RH in order to accelerate production.

→ Economical aspects

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