CHAPTER IV

EXPERIMENTAL RESULTS

4.1 Result of Experiments for Determining the Drying Air Flow Rate

Experimental data were taken at two different temperatures, namely 76 ^{o}C and 98 ^{o}C. The air flow rate was varied from 2.16 m/sec to 4.39 m/sec, while the other controllable parameters, i.e., hot air temperature, air humidity and the thickness of sol were kept constant. The thickness of sol was 2.2 mm. The air humidity was 0.029 kg water/kg dry air. The results are shown in Tables B1-7 and Figures 4.1, 4.2, 4.14, 4.15.

4.2 Experimental Results on Drying Rates at Various Air Temperatures

Experiments were done at various temperatures. The hot air temperature was varied from 30 ^{o}C to 98 ^{o}C, while the air flow rate was kept constant at 4.39 m/sec, the air humidity at 0.028 kg water/kg dry air and the thickness of sol at 1.5, 2.2, 3.5 and 4.5 mm. The results are shown in Tables B-3, 7, 8, 9, 12, 13, 15, 16, 18, 19, 21, 22 and Figures 4.3 - 4.6 and 4.16 - 4.19.

4.3 Experimental Results on Drying Rates of Various Slab Thickness

Experimental data were taken at four different temperatures, namely 32 ^{o}C, 57 ^{o}C, 76 ^{o}C and 98 ^{o}C. The thickness of sol was varied from 1.5 mm. to 4.5 mm., while the other controlable parameter, i.e., air flow rate was 4.39 m/sec and the air humidity was 0.029 kg water/

kg dry air. The results are shown in Tables B-2, 4, 8, 9, 12-23 and Figures 4.7-4.10 and 4.20-4.23

4.4 Experimental Results on Drying Rates at Various Humidities.

The results of the experiment are presented in Tables B-10, 11, 27, 28 and graphically in Figures 4.11 and 4.24. The humidity of air was varied from 5% relative humidity to 23% relative humidity. The other controllable parameters were held constant, i.e., the air temperature was constant at 98°C and the thickness of sol was 2.2 mm.

4.5 Experimental Results on Thermal Degradation of Gelatin

Table 4.1 and Figure 4.27 show the experimental results of the effect of drying temperature on the Bloom strength and viscosity of gelatin. Drying of the sols were done at various temperatures. The hot air temperature was varied from 30°C to 98°C while the other controllable parameters were kept constant. Final moisture content after drying ranges from 3.72% to 13.95%

Table 4.2 shows the experimental result of the effect of heating time on the Bloom strength and viscosity of gelatin. The gelatin power was heated at 105°C. The time was varied from 0.5 hour to 5 hours.

Other experiments were done by drying the gelatin solution at 98°C, using air flow rate at 4.39 m/sec, and 2.2 mm. thickness of sol. Then its properties were determined. The dried gelatin was dissolved and dried again at the same condition. The process was repeated two more times. The experimental results are shown in Table 4.3

4.6 Rate of Drying of Gelatin Gel

Gelatin gel was dried at 25°C with air humidity was 0.013 kg water/kg dry air, air flow rate was 4.39 m/sec and the thickness of slab was 2.2 mm. The result is shown in Table B-29 and Figures 4.12 and 4.25

Table 4.1 Thermal Degradation on Gelatin Properties

Drying Temperature (°C)	Drying Time (min)	Bloom strength (gm)	Viscosity (cp)
30	1440	276	3.7466
57	445	257	3.7861
76	400	250	3.7564
98	335	232	3.2115

Table 4.2 Effect of Drying time on Gelatin Properties

Drying time (hr)	Bloom strength (gm)	Viscosity (cp)
0.0	286	3.6002
0.5	264	3.6089
1.0	261	3.6934
1.5	263	3.7178
2.5	263	3.8039
5.0	222	3.7159

Table 4.3 Effect of repeating drying on Gelatin Properties

air temperature = 98 °C

No. of drying	Time (min)	Bloom strength (gm)	Viscosity (cp)
1	255	232	3.2115
2	255	197	3.5475
3	255	186	3.5985
4	245	183	3.6618

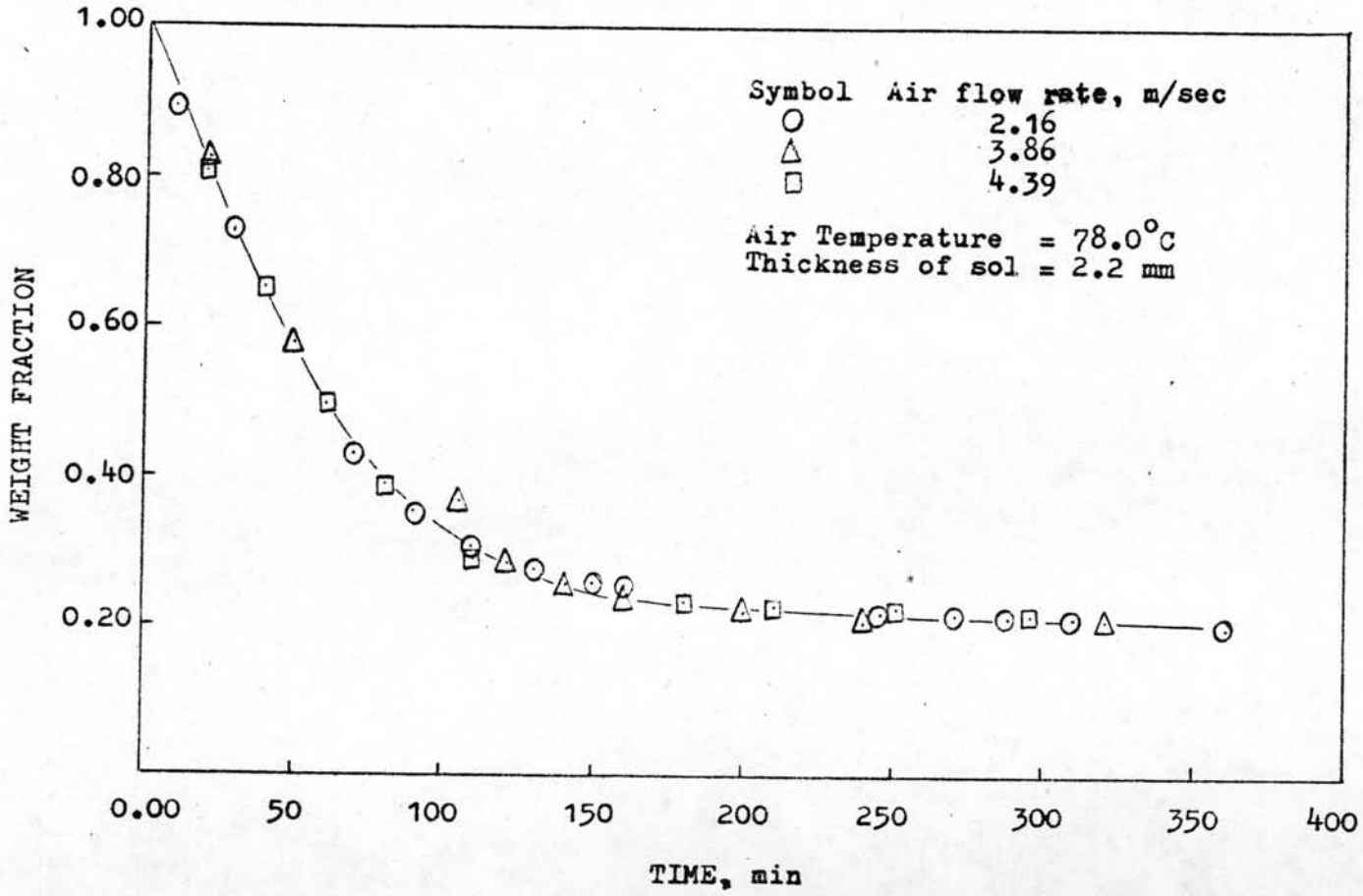

Figure 4.1 Weight fraction v.s drying time at various air flow rates

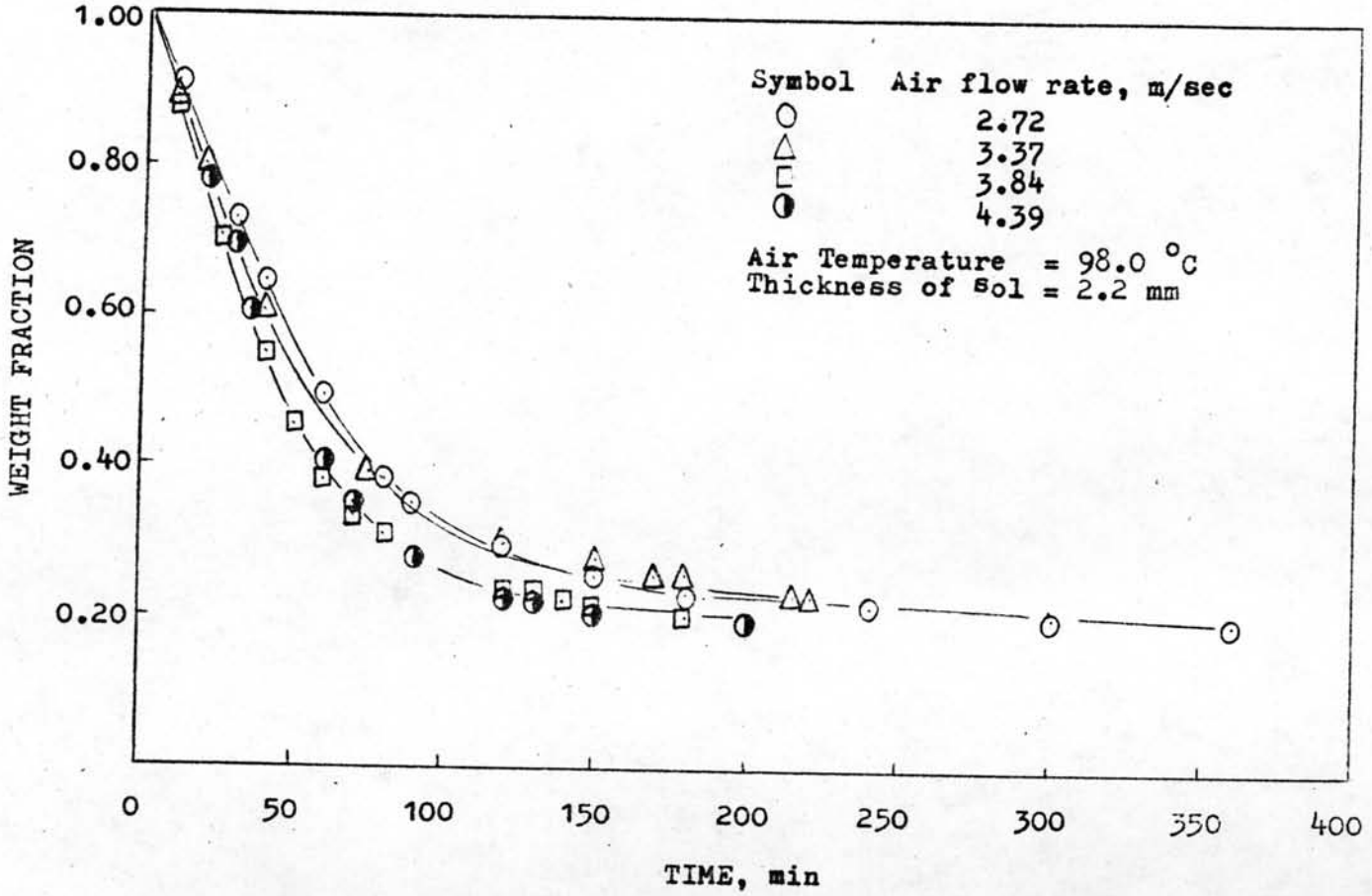

Figure 4.2 Weight fraction v.s drying time at various air flow rates

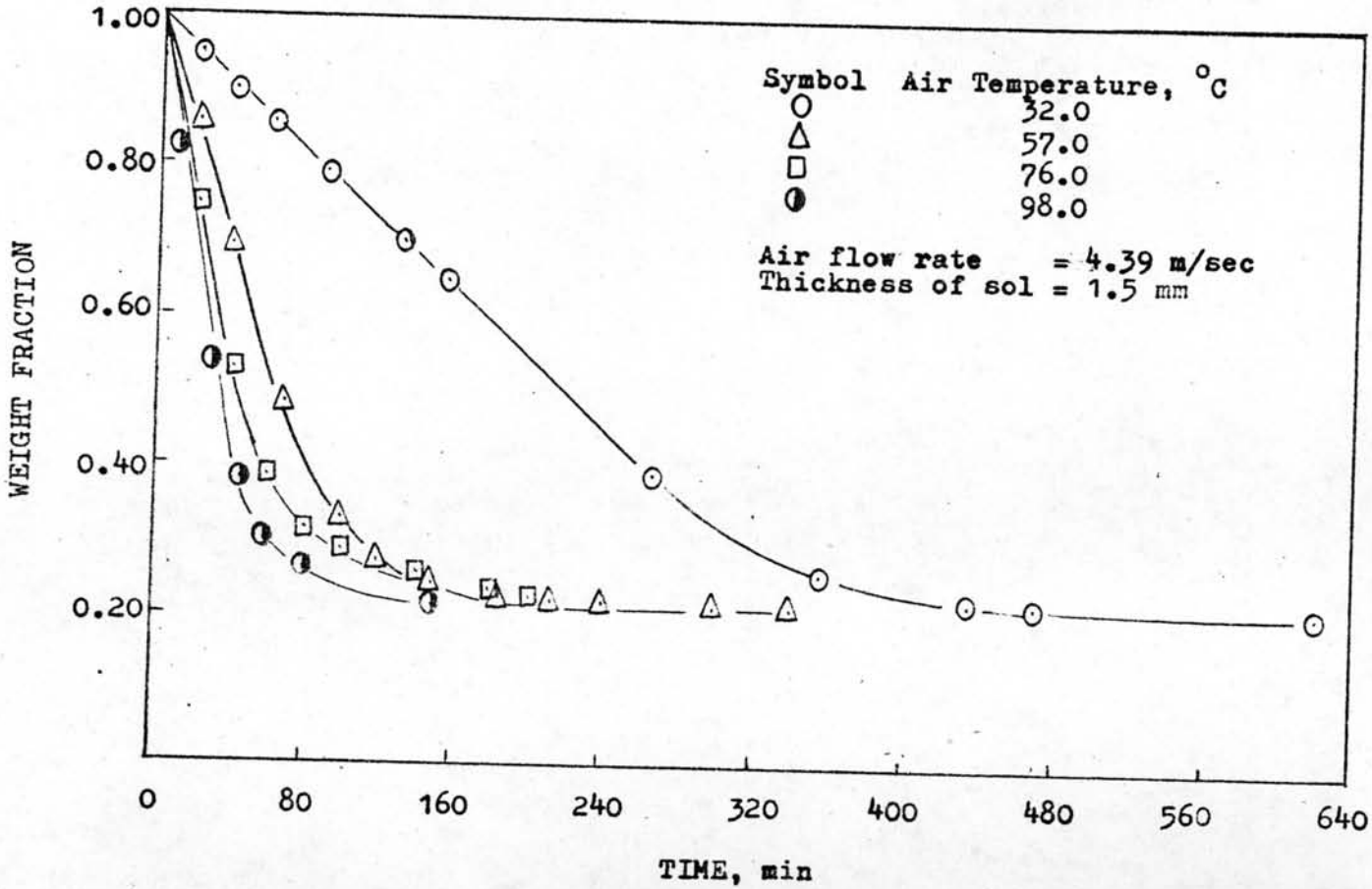

Figure 4.3 Weight fraction v.s drying time at various air temperatures

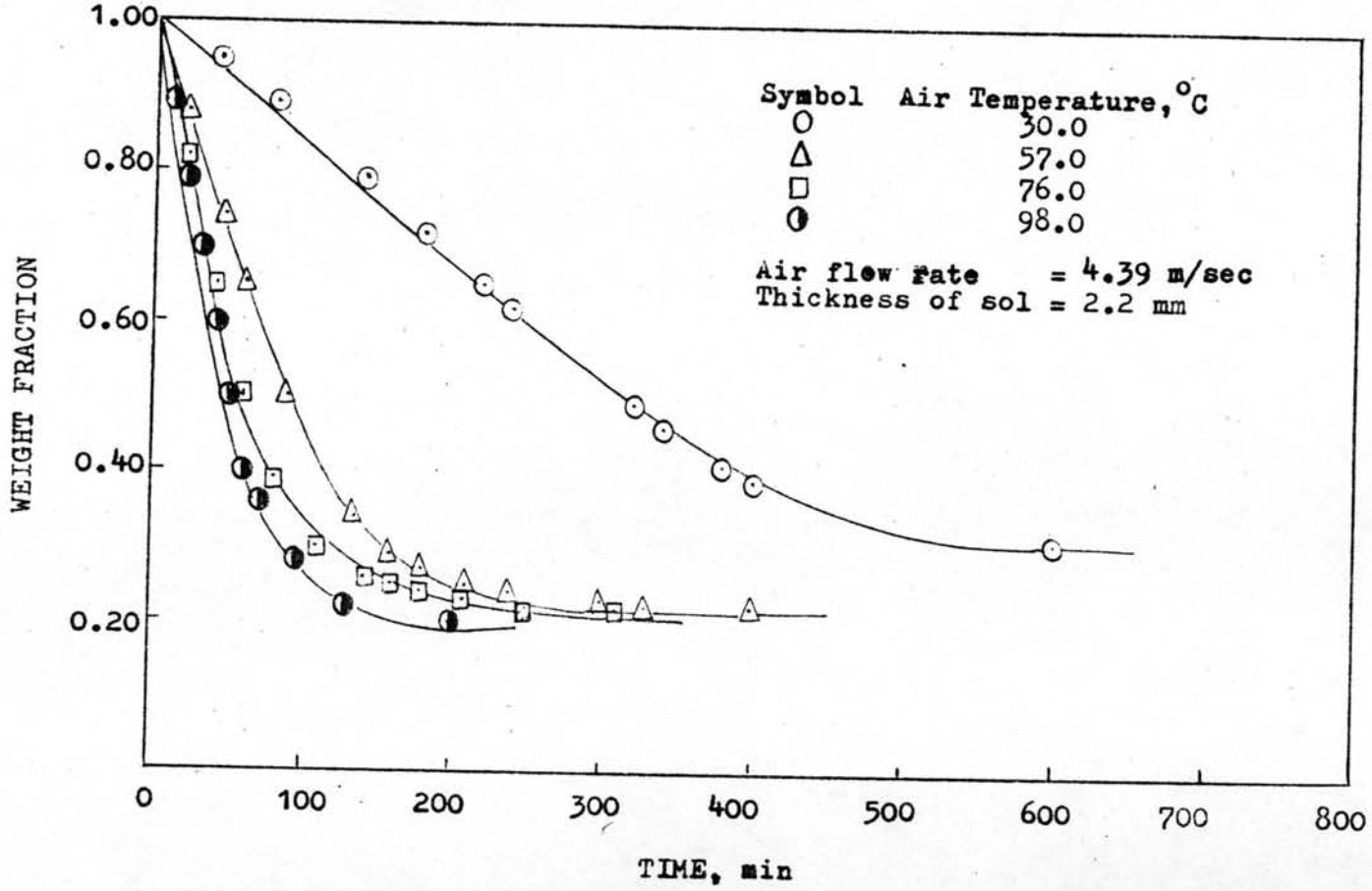

Figure 4.4 Weight fraction v.s drying time at various air temperatures

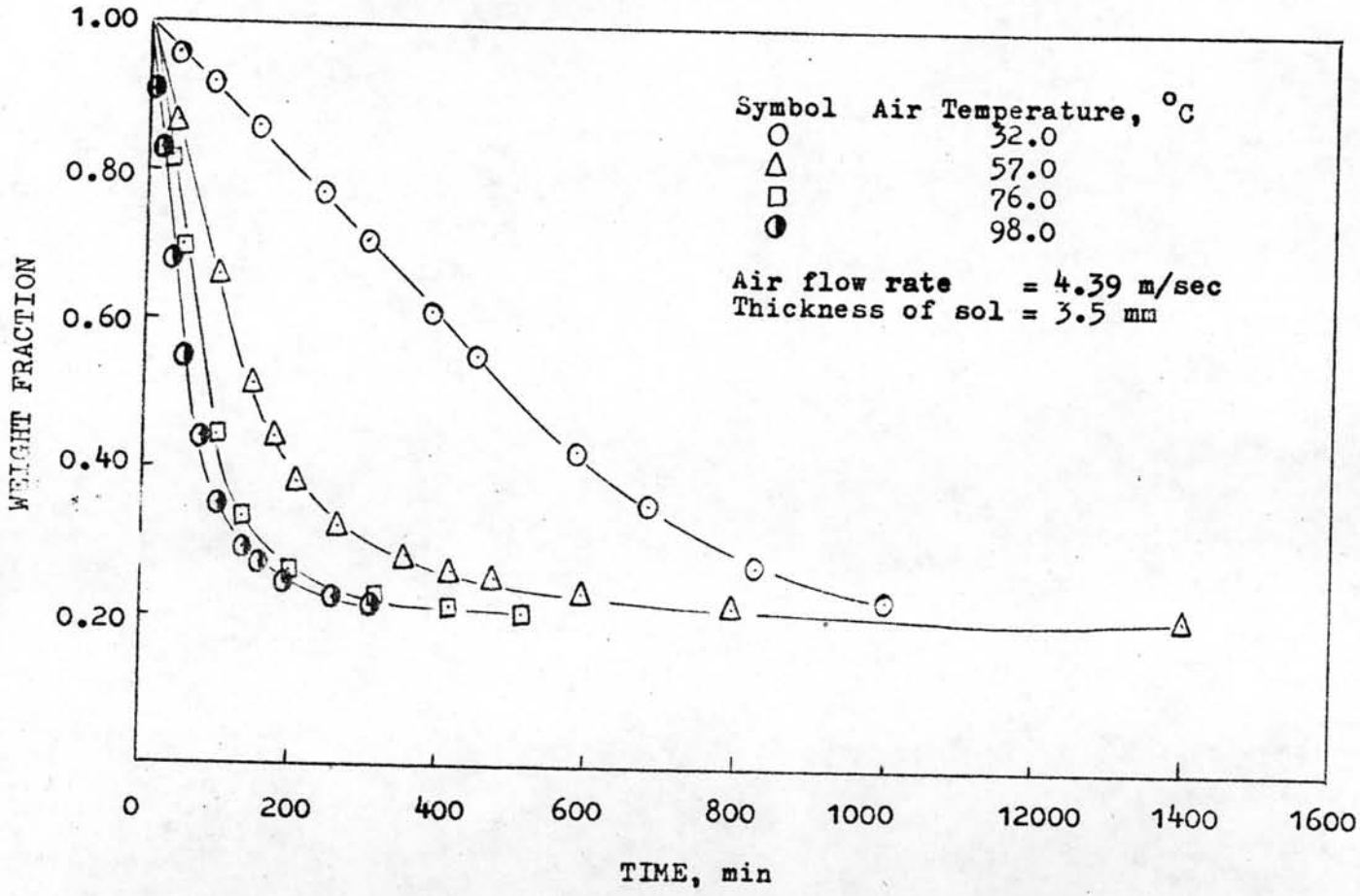

Figure 4.5 Weight fraction v.s drying time at various air temperatures

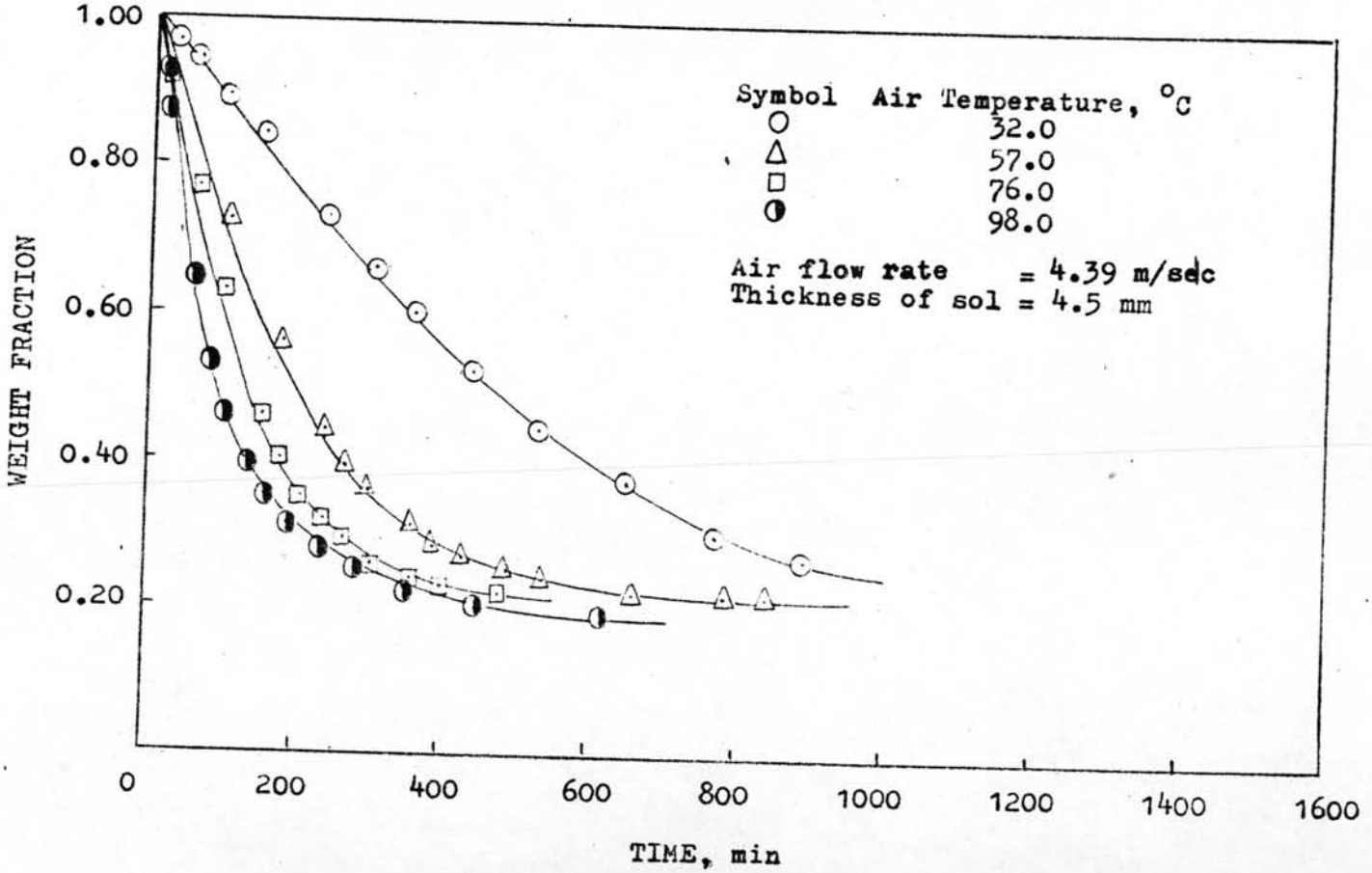

Figure 4.6 Weight fraction v.s drying time at various air temperatures

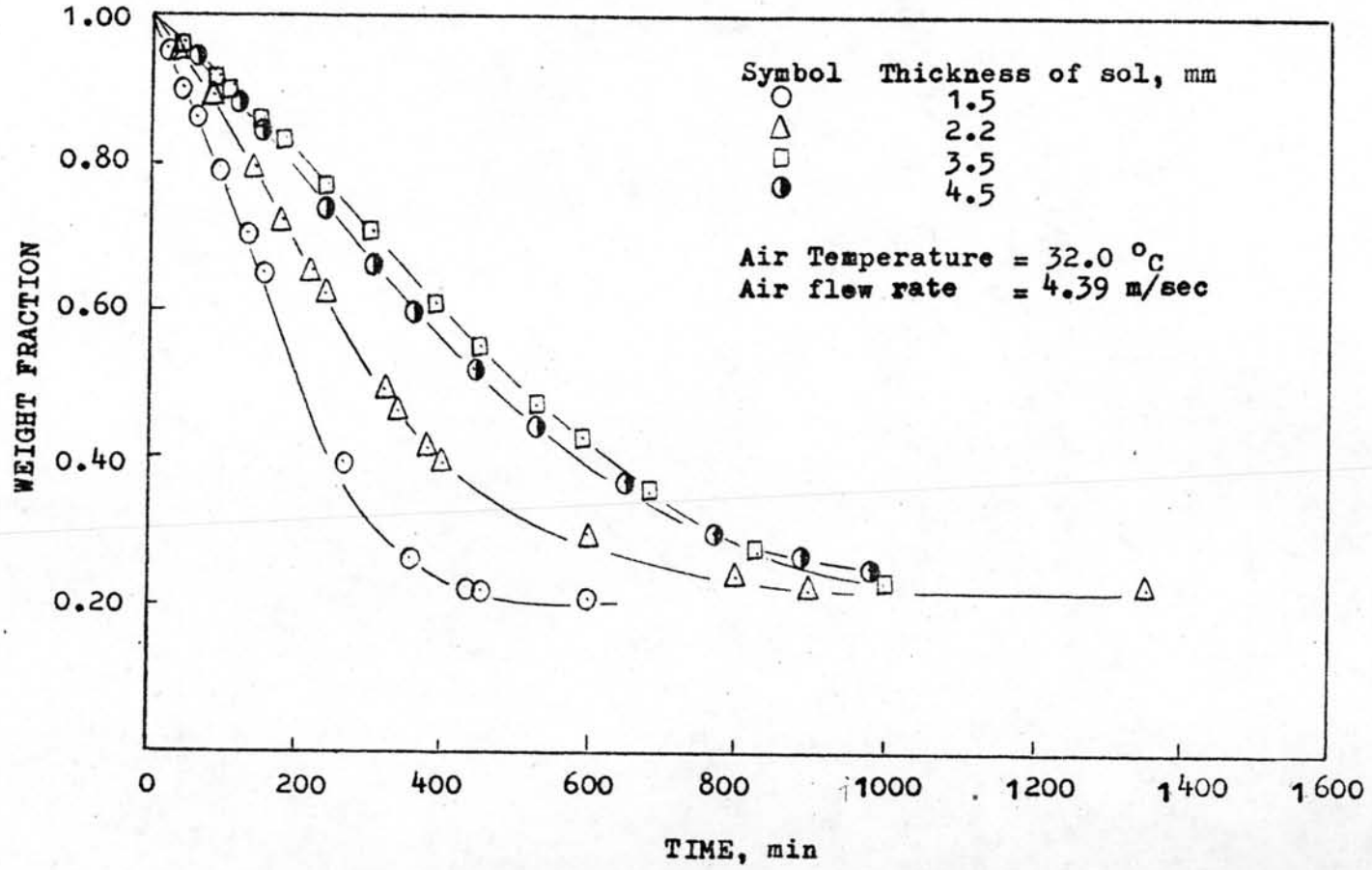

Figure 4.7 Weight fraction vs. drying time at various thickness of sol

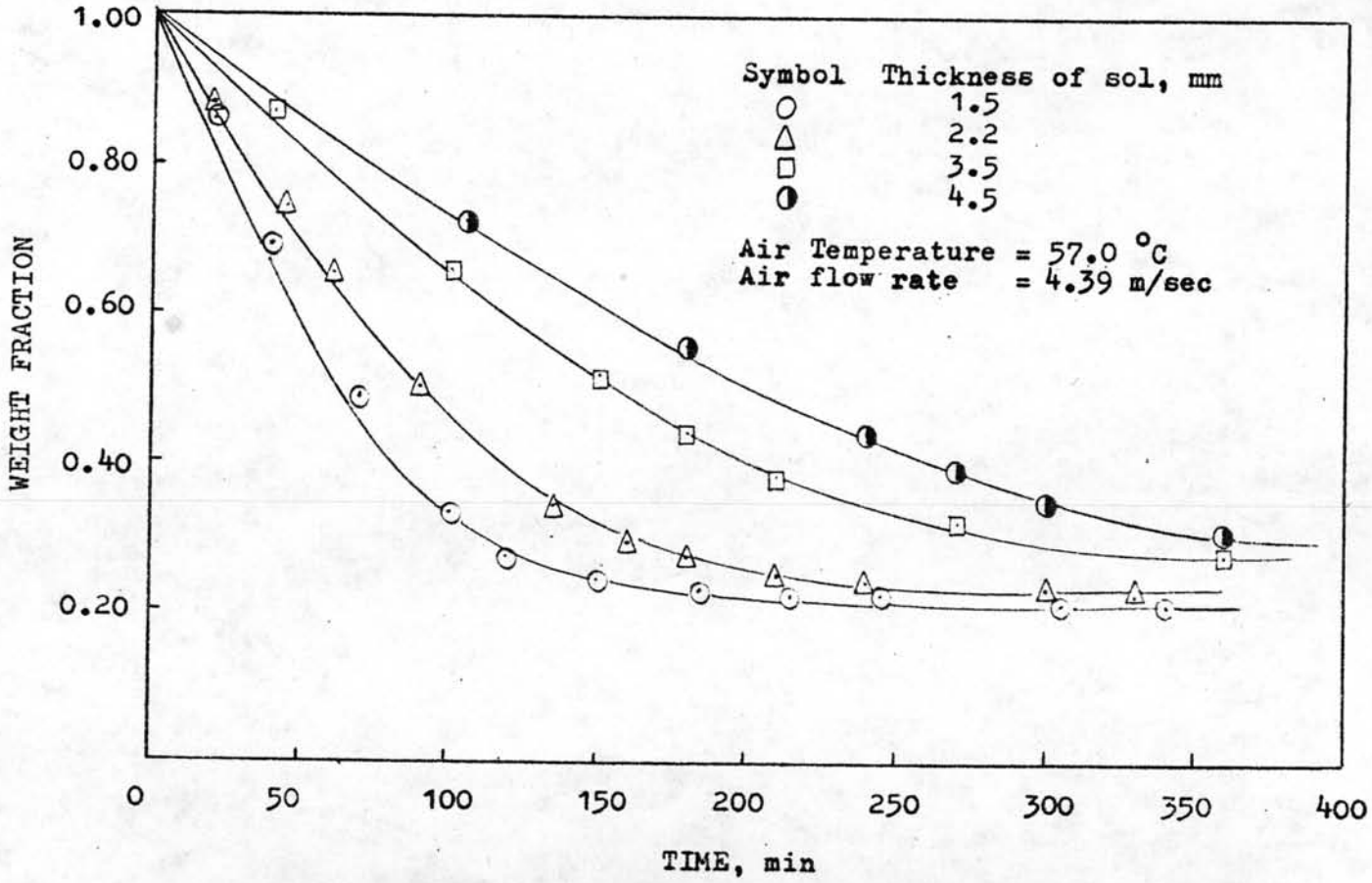

Figure 4.8 Weight fraction v.s drying time at various thickness of sol

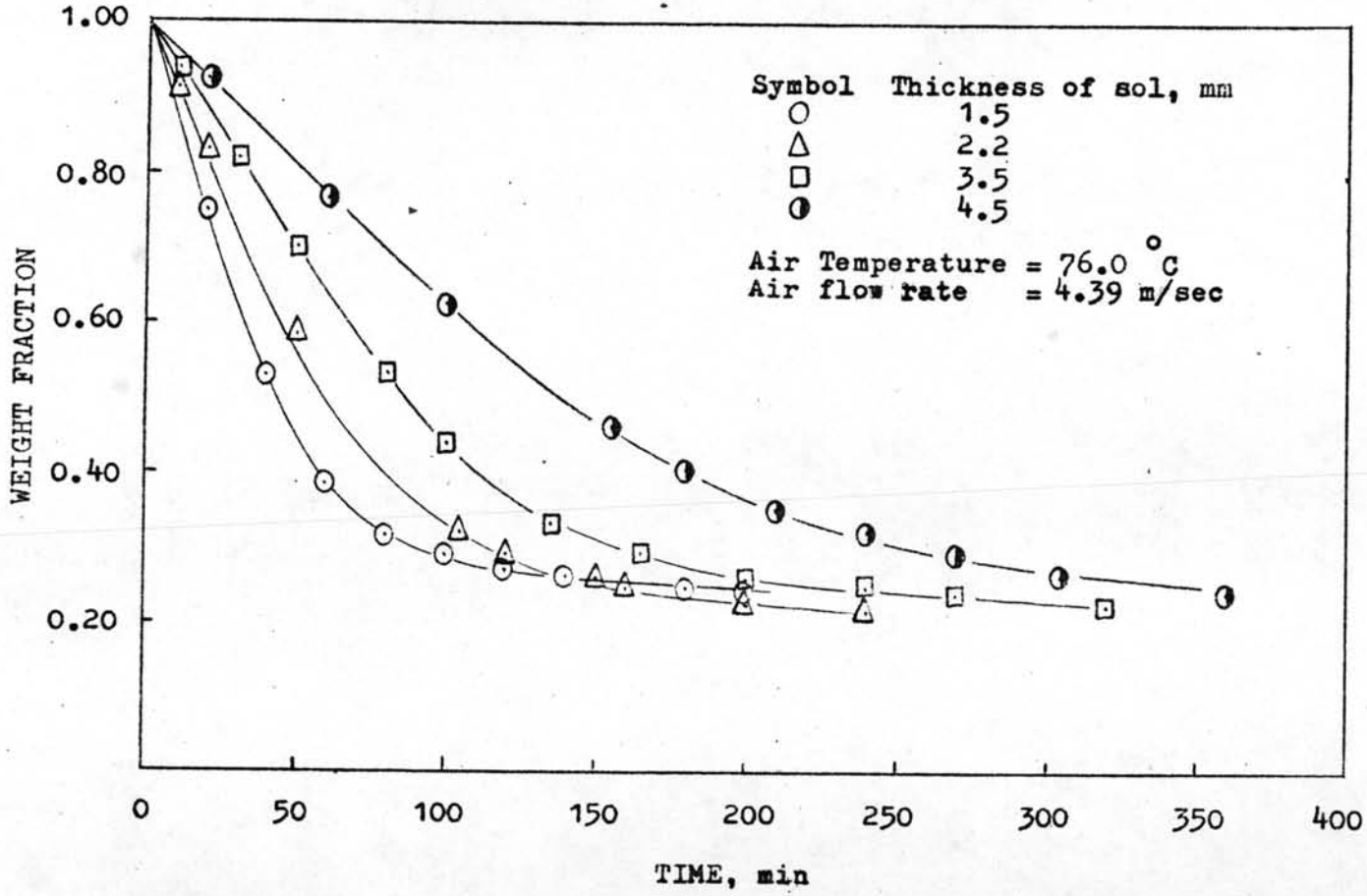

Figure 4.9 Weight fraction v.s drying time at various thickness of sol

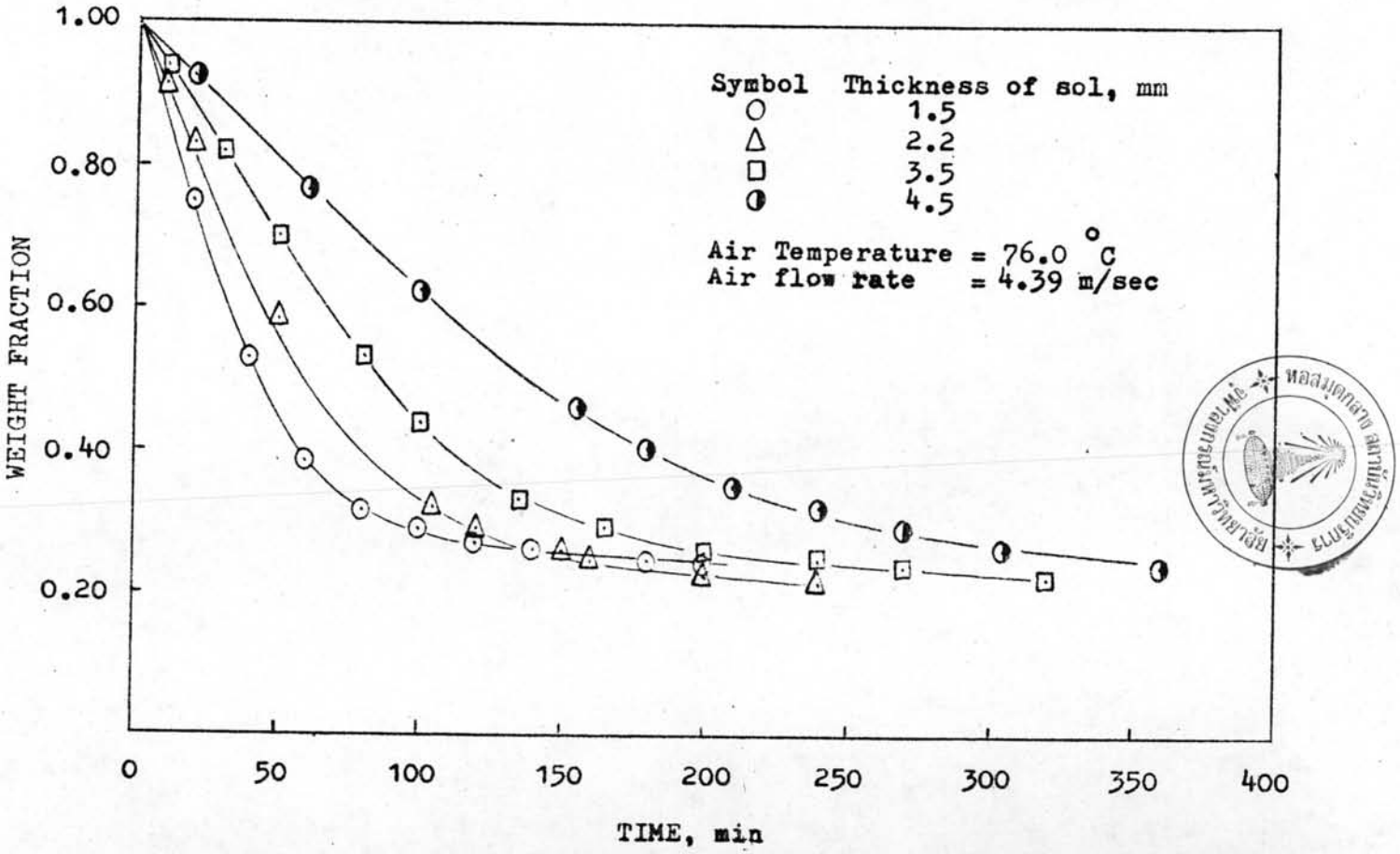

Figure 4.9 Weight fraction v.s drying time at various thickness of sol

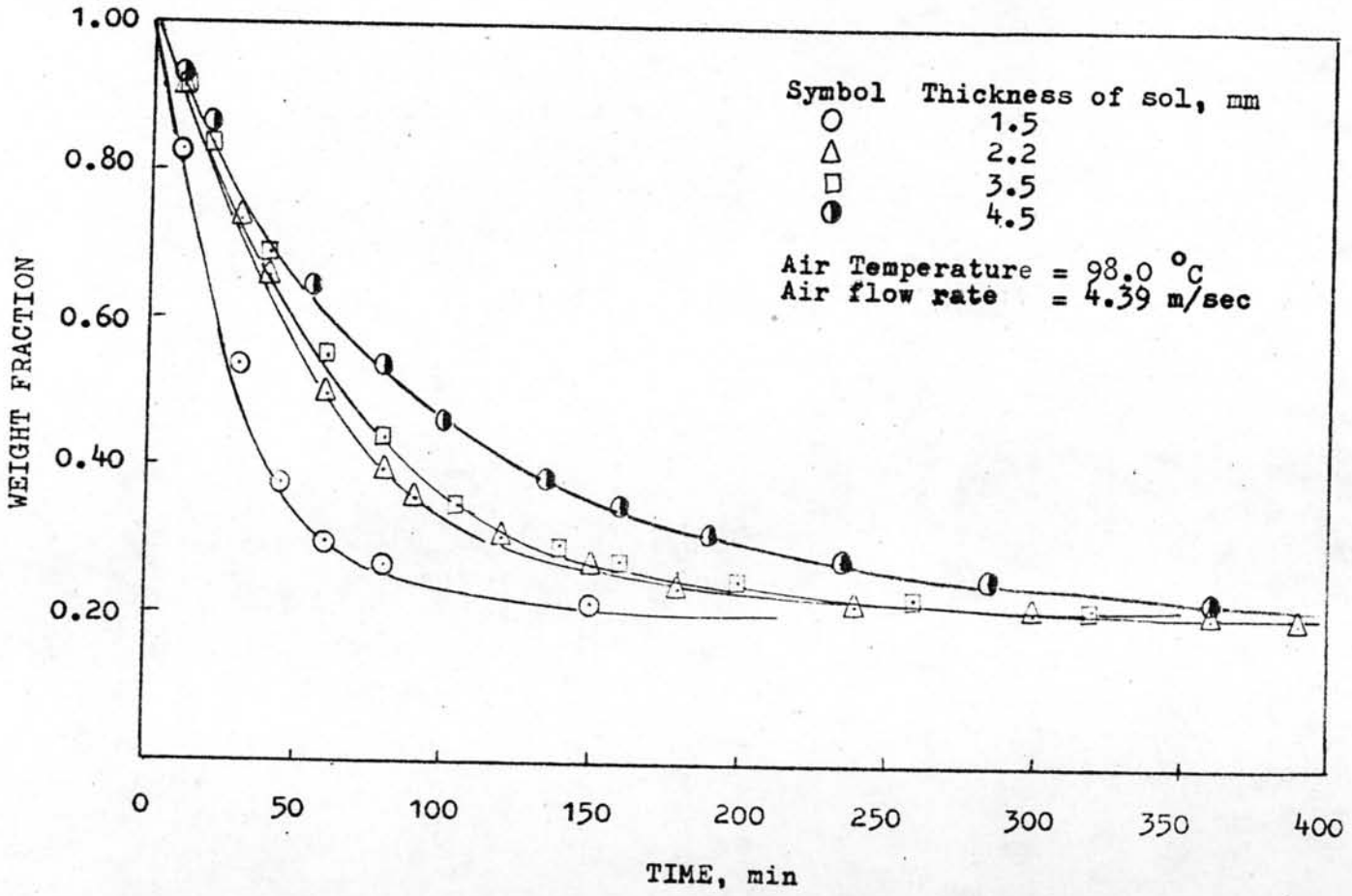

Figure 4.10 Weight fraction v.s drying time at various thickness of sol

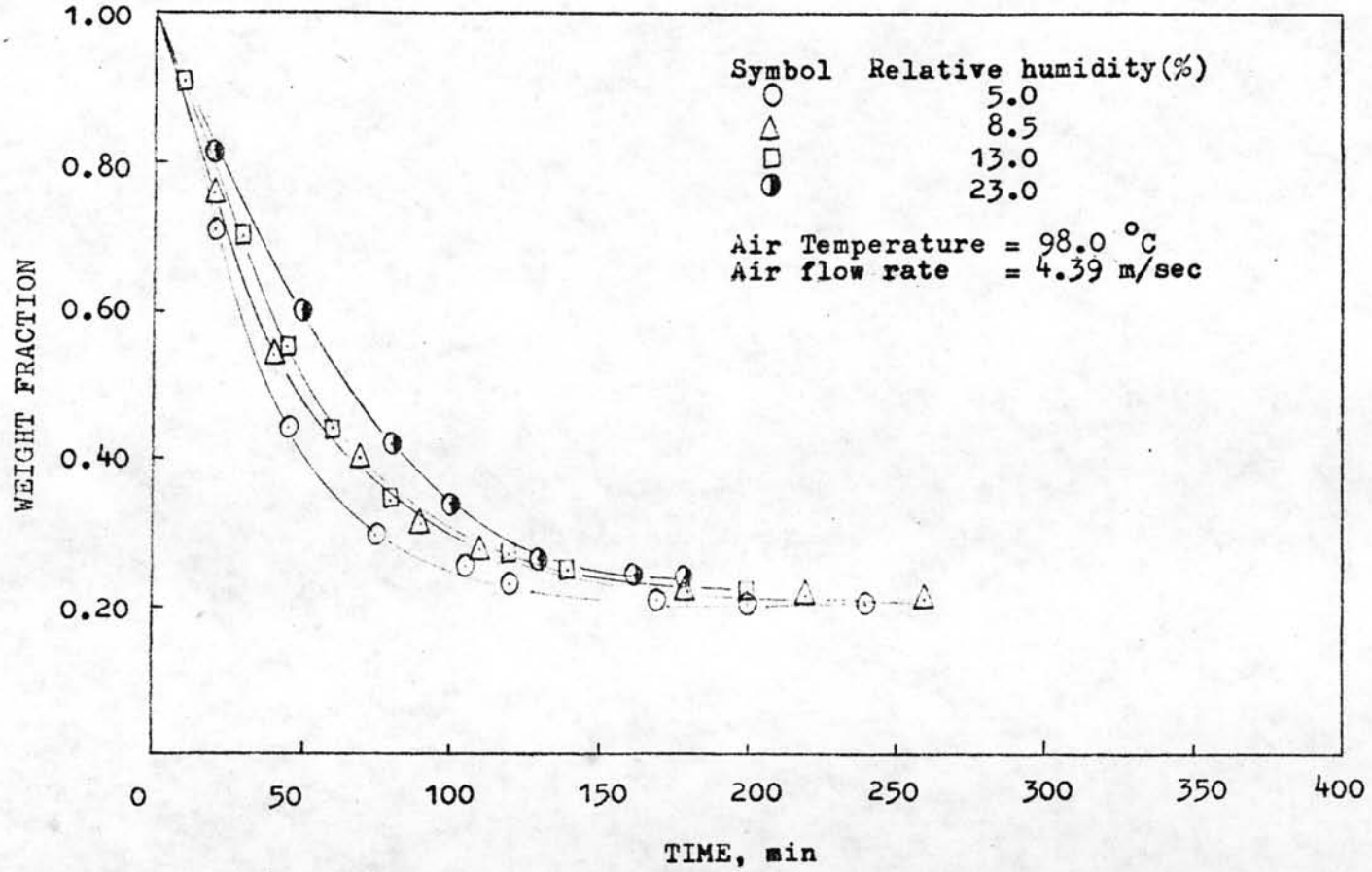

Figure 4.11 Weight fraction v.s time at various humidity

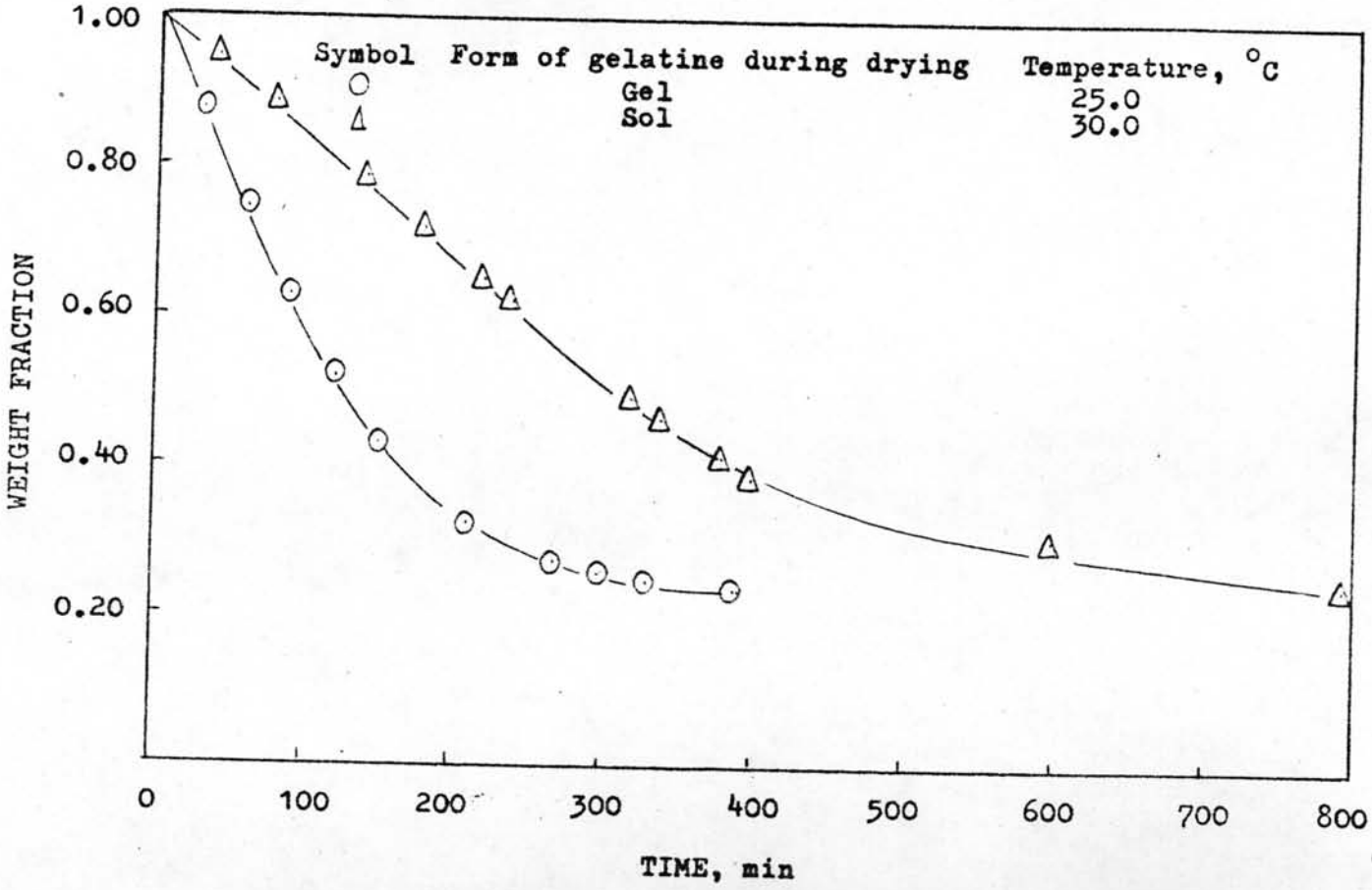

Figure 4.12 Weight fraction v.s time at dry in Gel form and Sol form

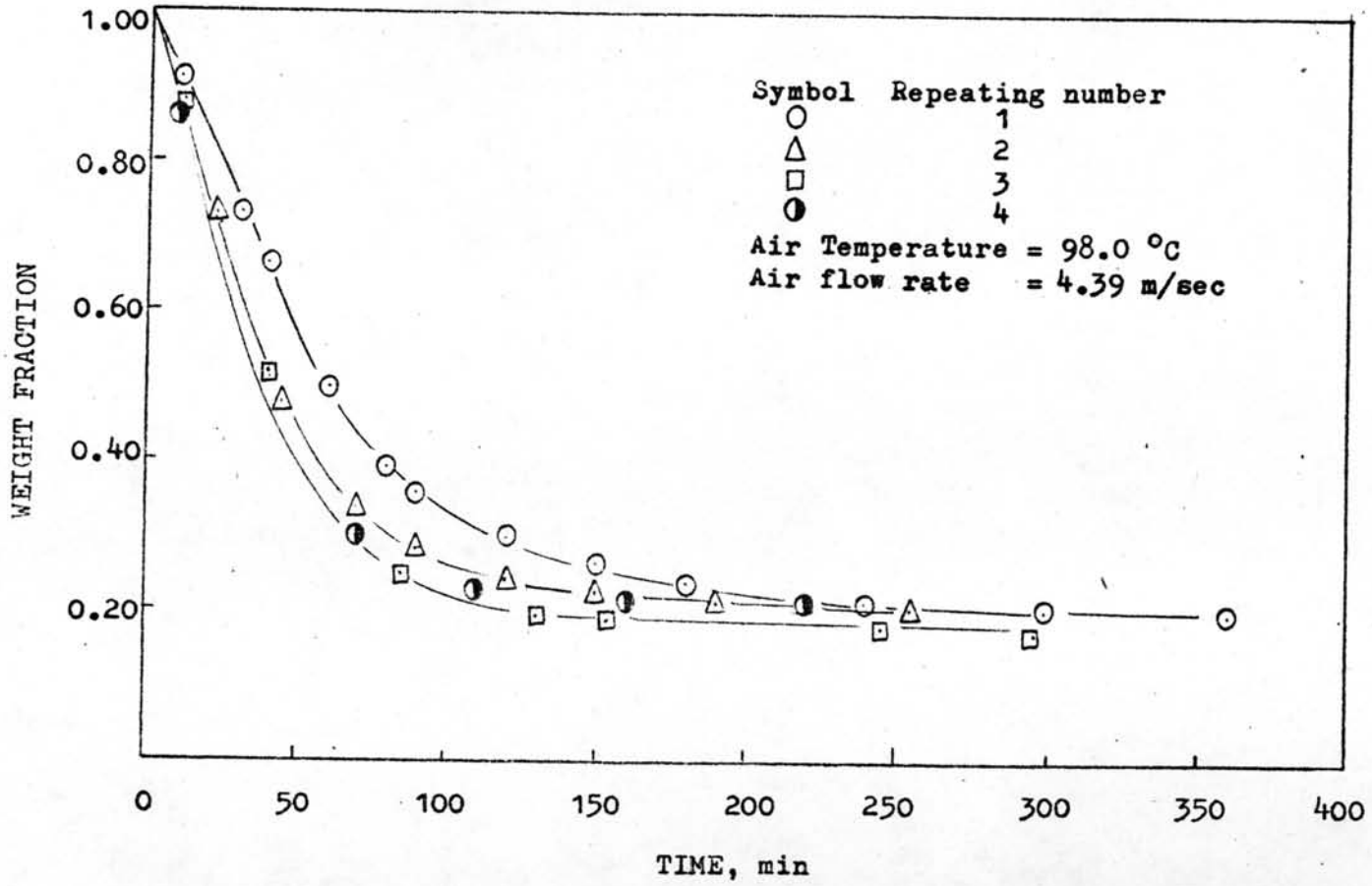

Figure 4.13 Weight fraction v.s drying time at various repeating numbers

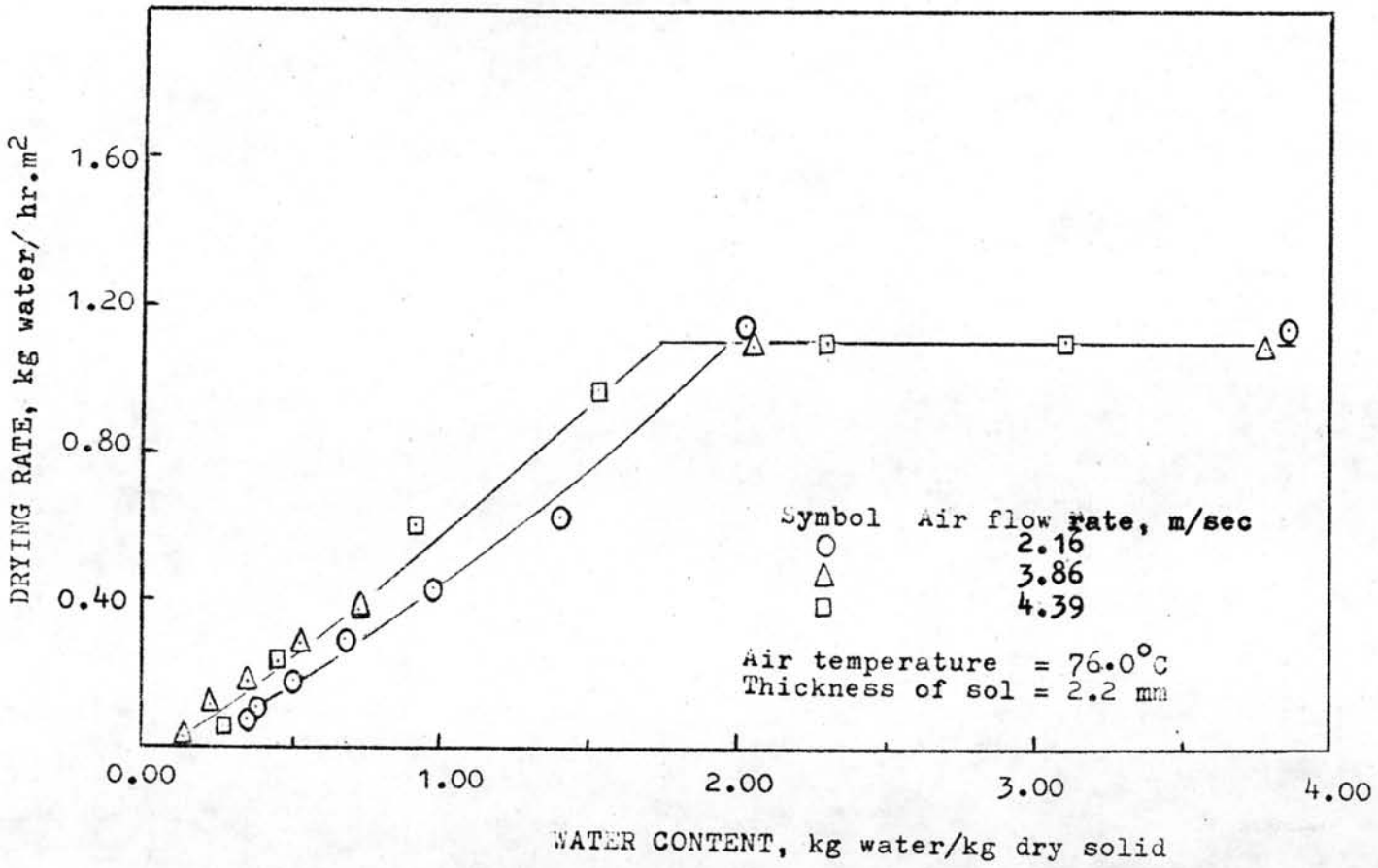

Figure 4.14 Drying Rate v.s water content at various air flow rates

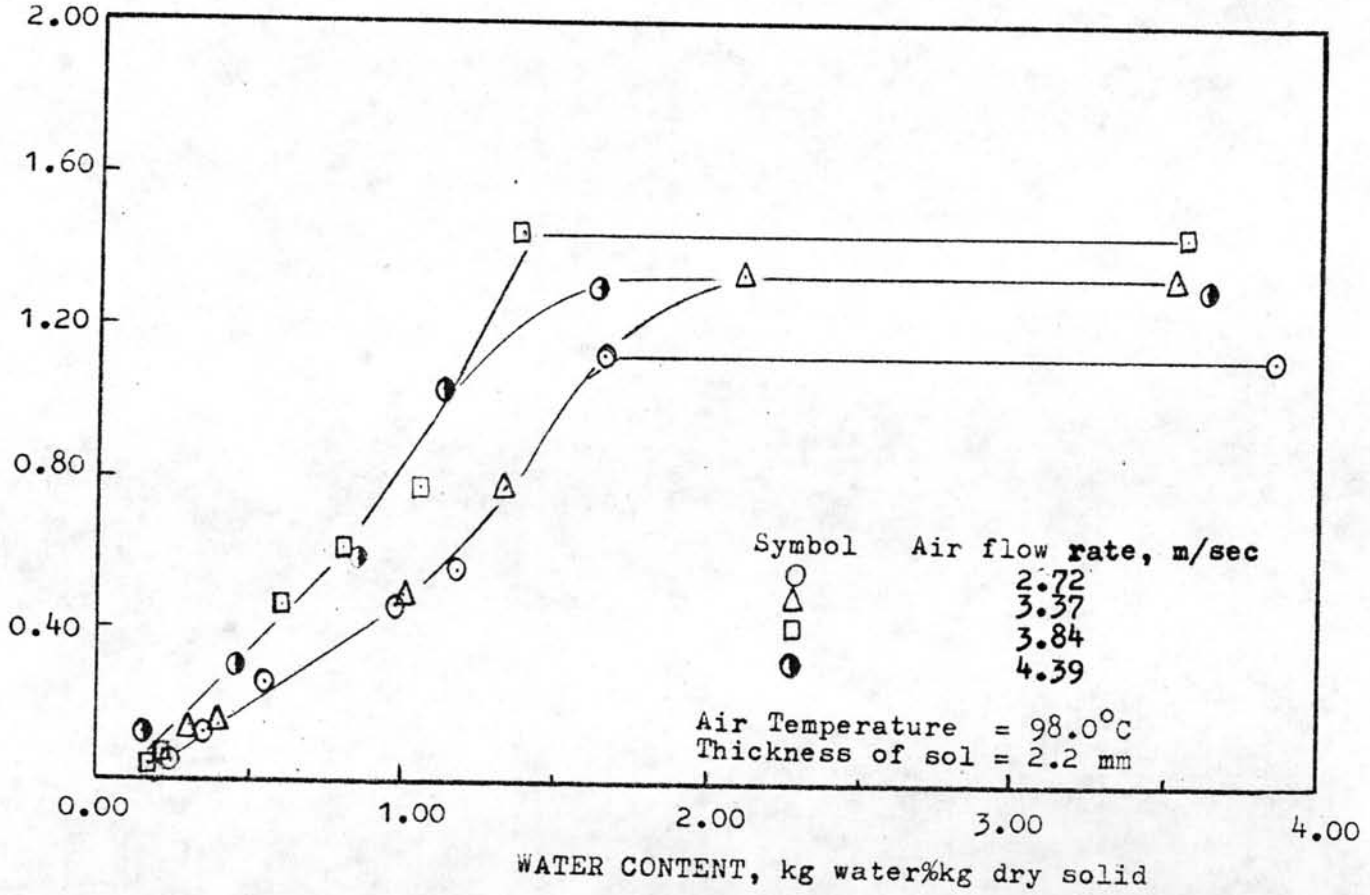

Figure 4.15 Drying Rate v.s water content at various flow rates

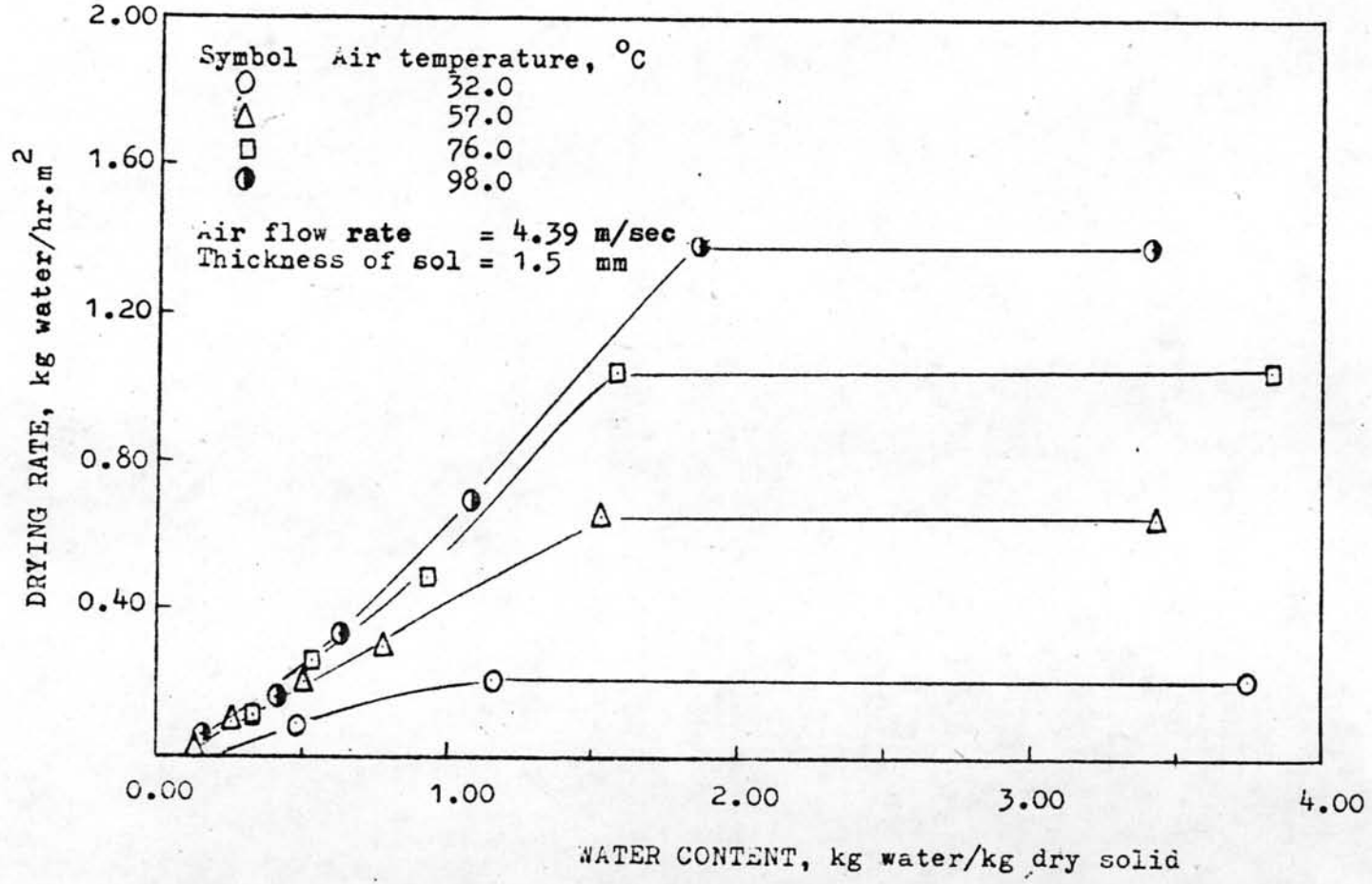

Figure 4.16 Drying Rate v.s water content at various air temperatures

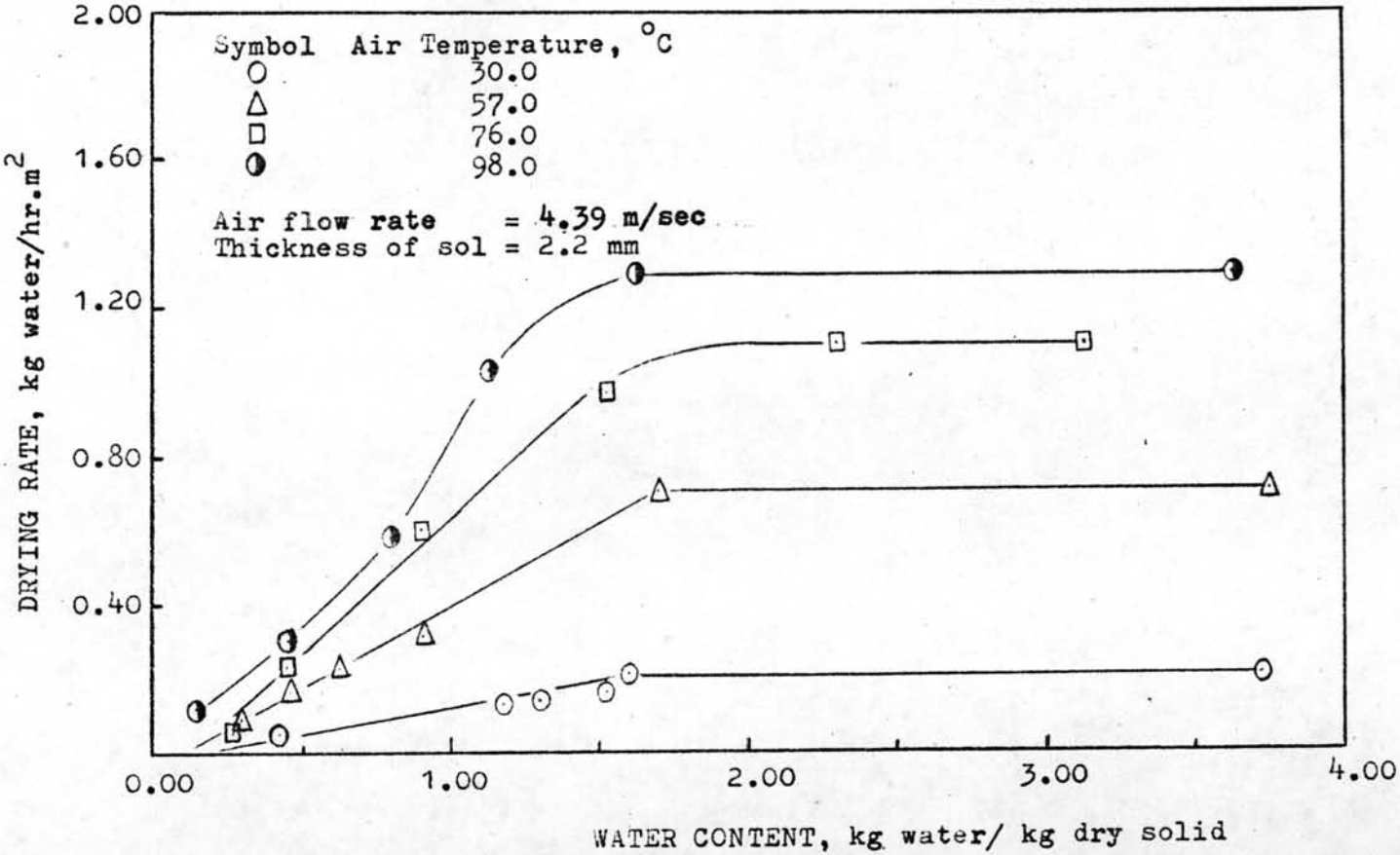

Figure 4.17 Drying Rate v.s water content at various temperatures

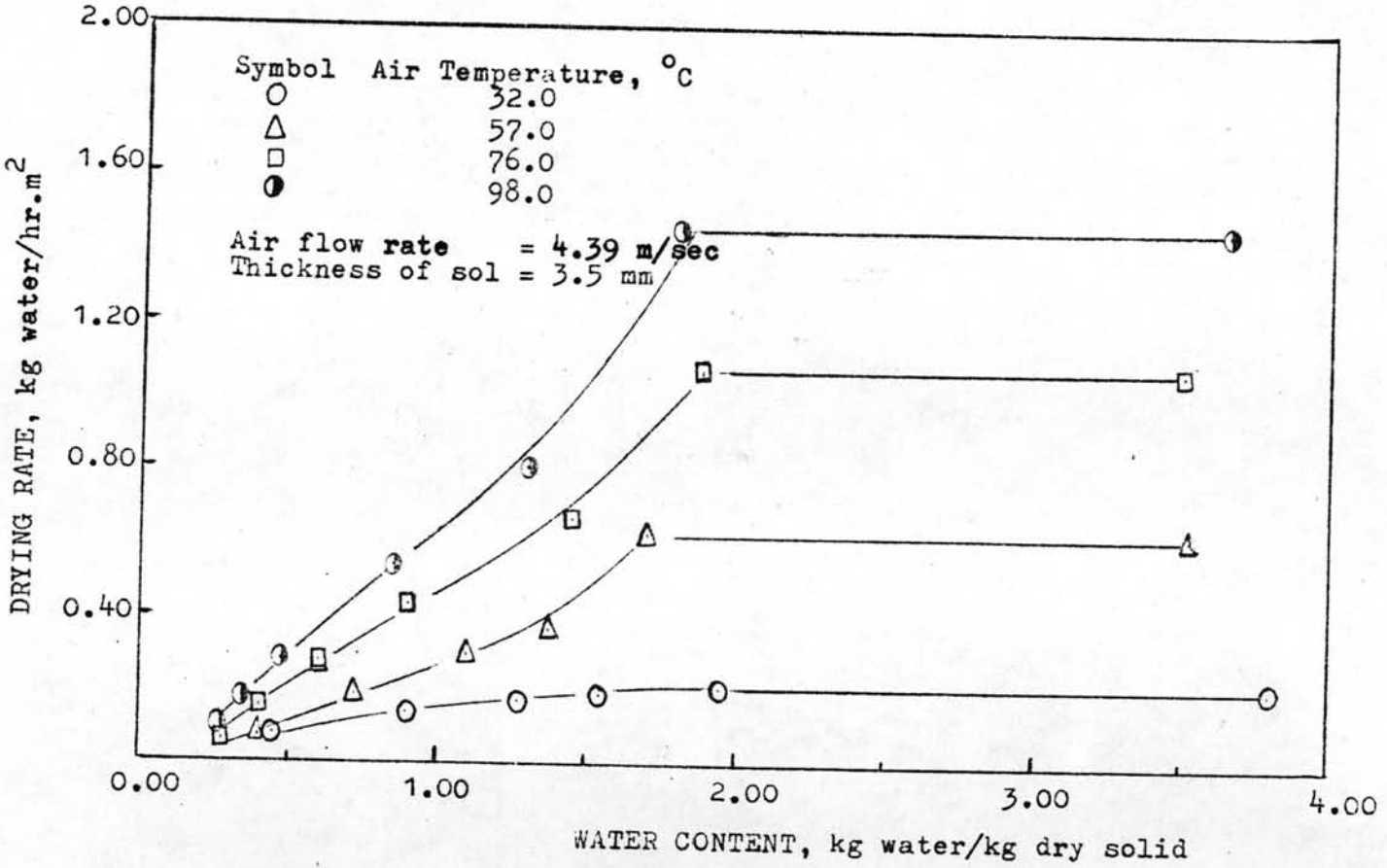

Figure 4.18 Drying Rate v.s water content at various air temperatures

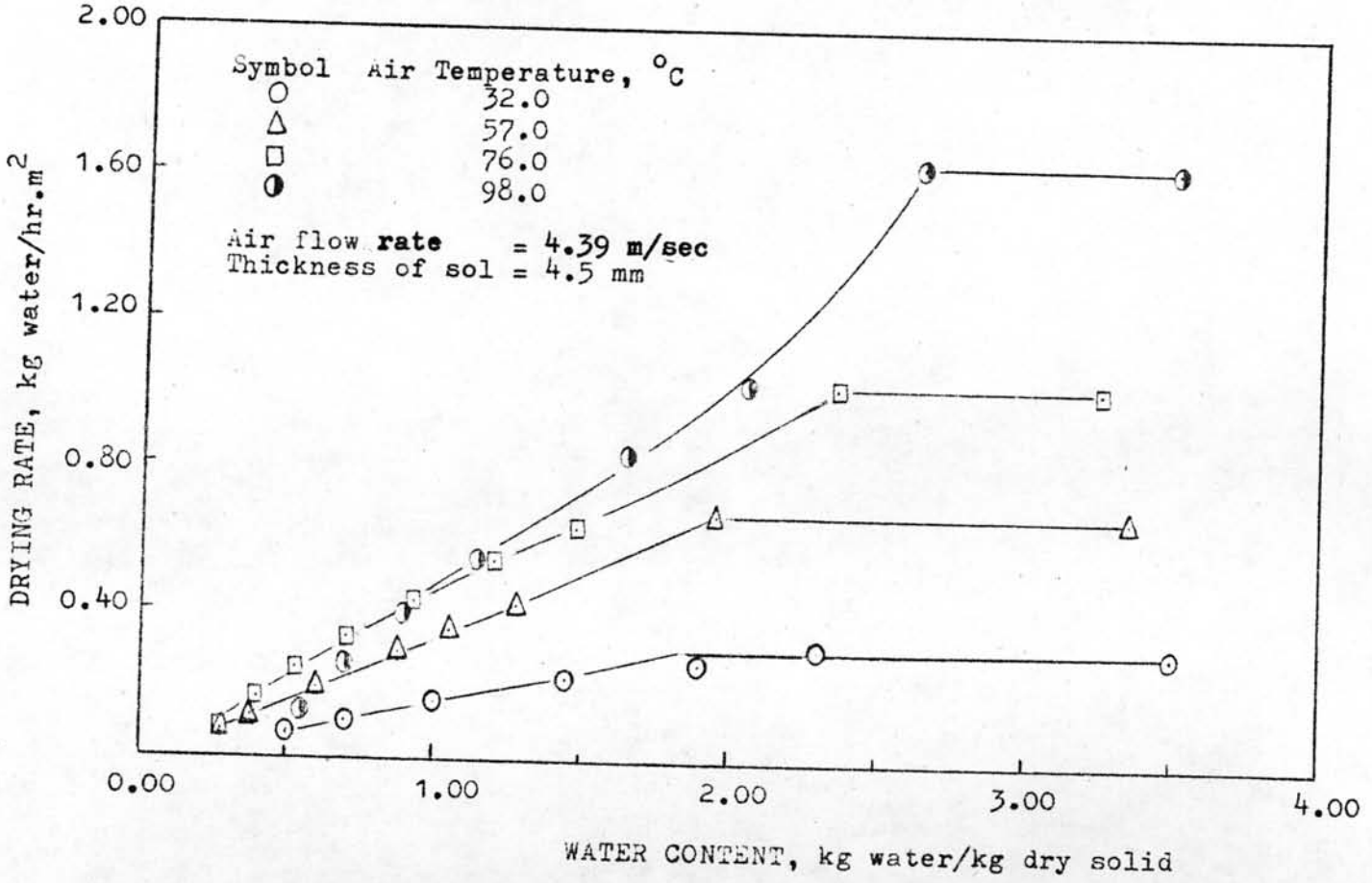

Figure 4.19 Drying Rate v.s water content at various temperatures

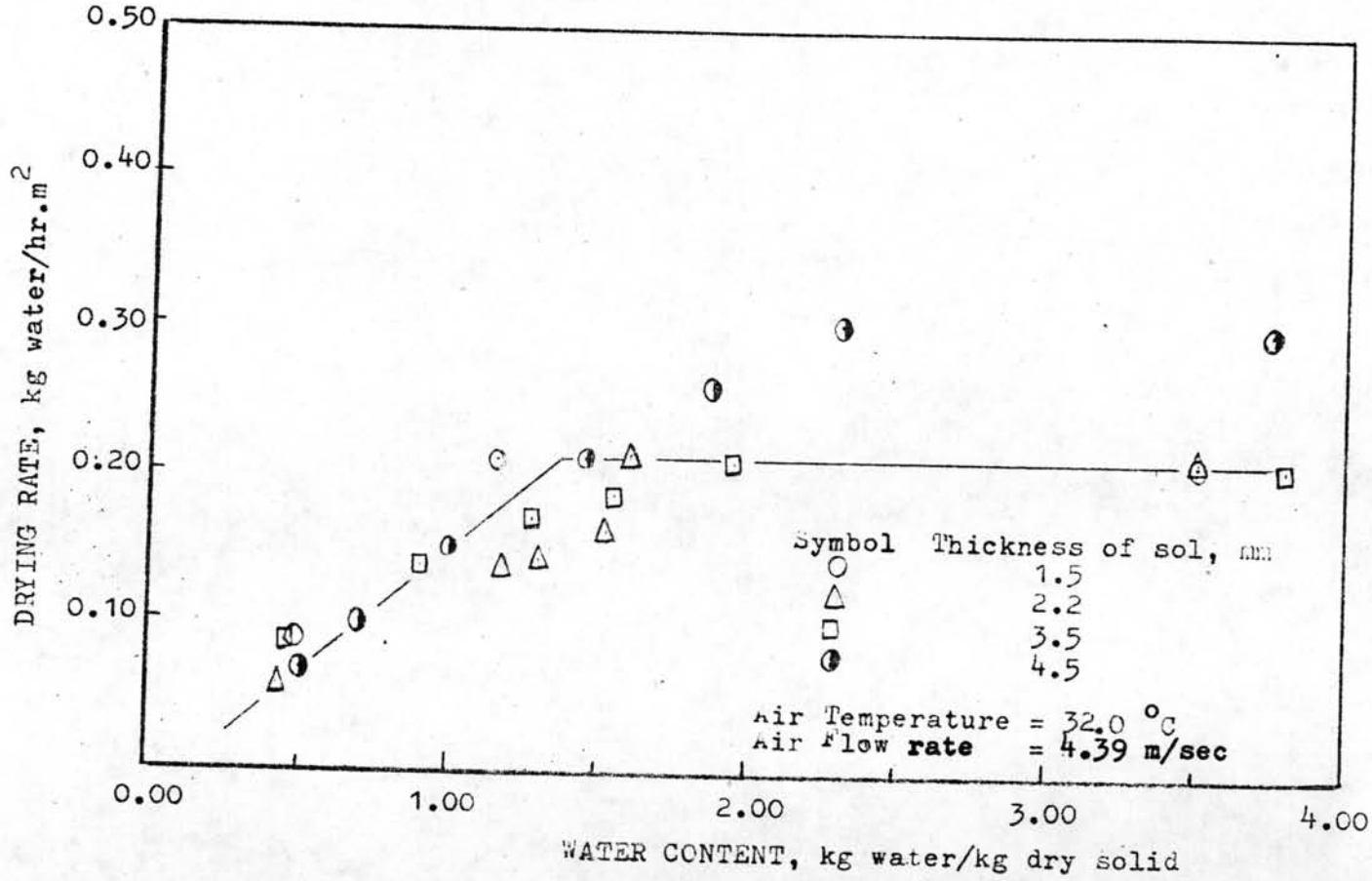

Figure 20 Drying Rate v.s water content at various thickness of sols.

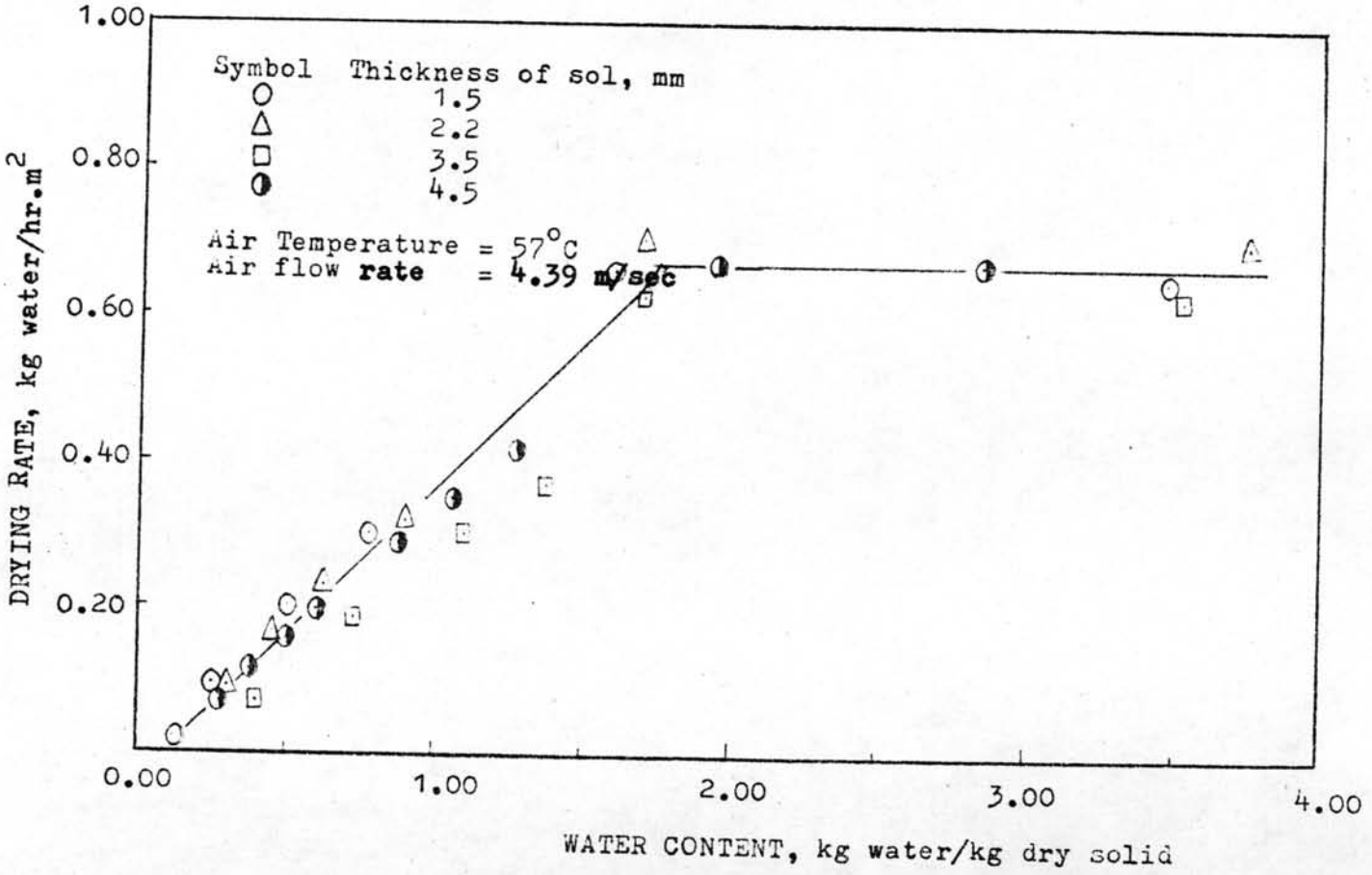

Figure 4.21 Drying Rate v.s water content at various thickness of sol

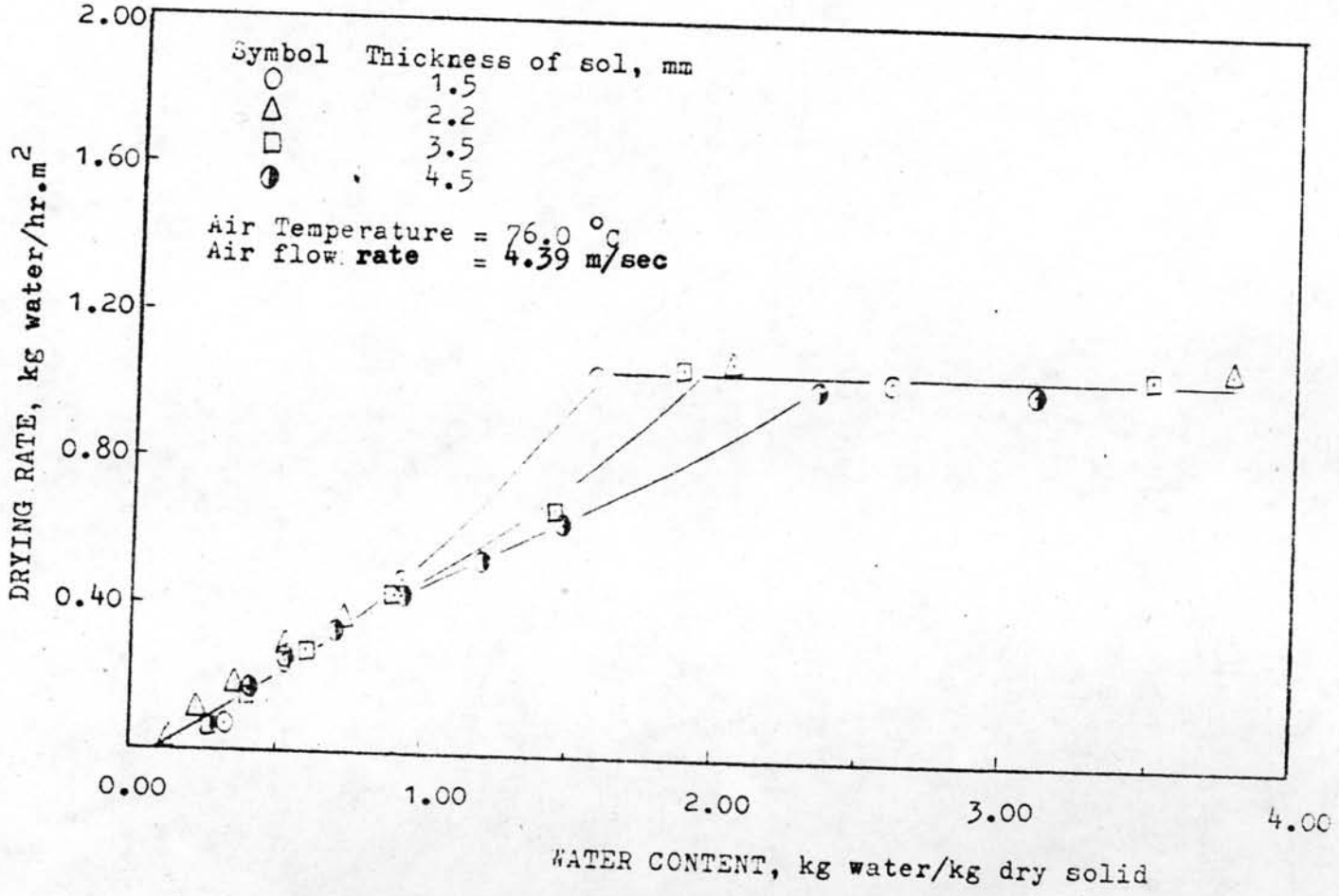

Figure 4.22 Drying Rate v.s water content at various thickness of sol

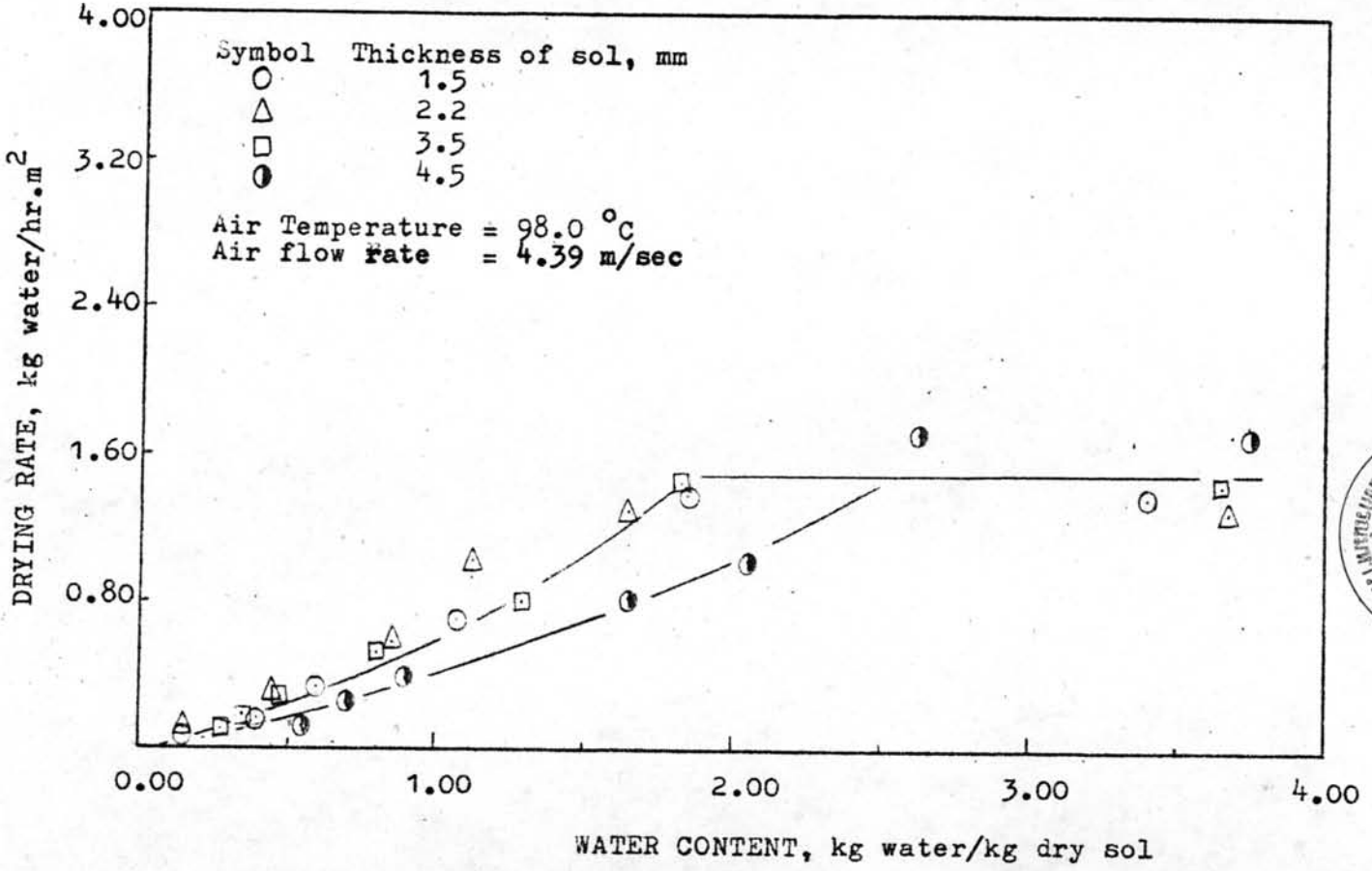

Figure 4.23 Drying Rate v.s water content at various thickness of sol

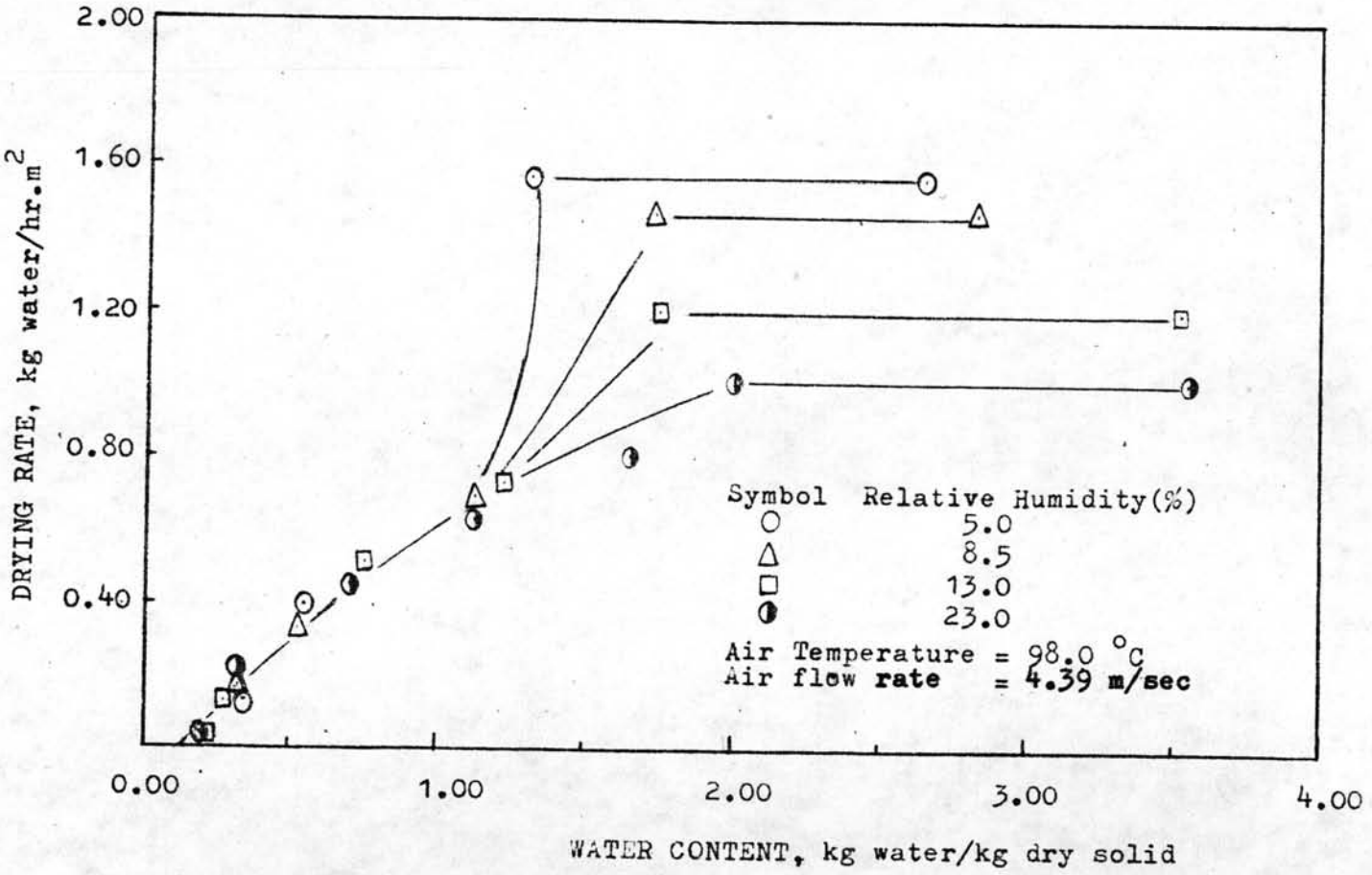

Figure 4.24 Drying Rate v.s water content at various humidities

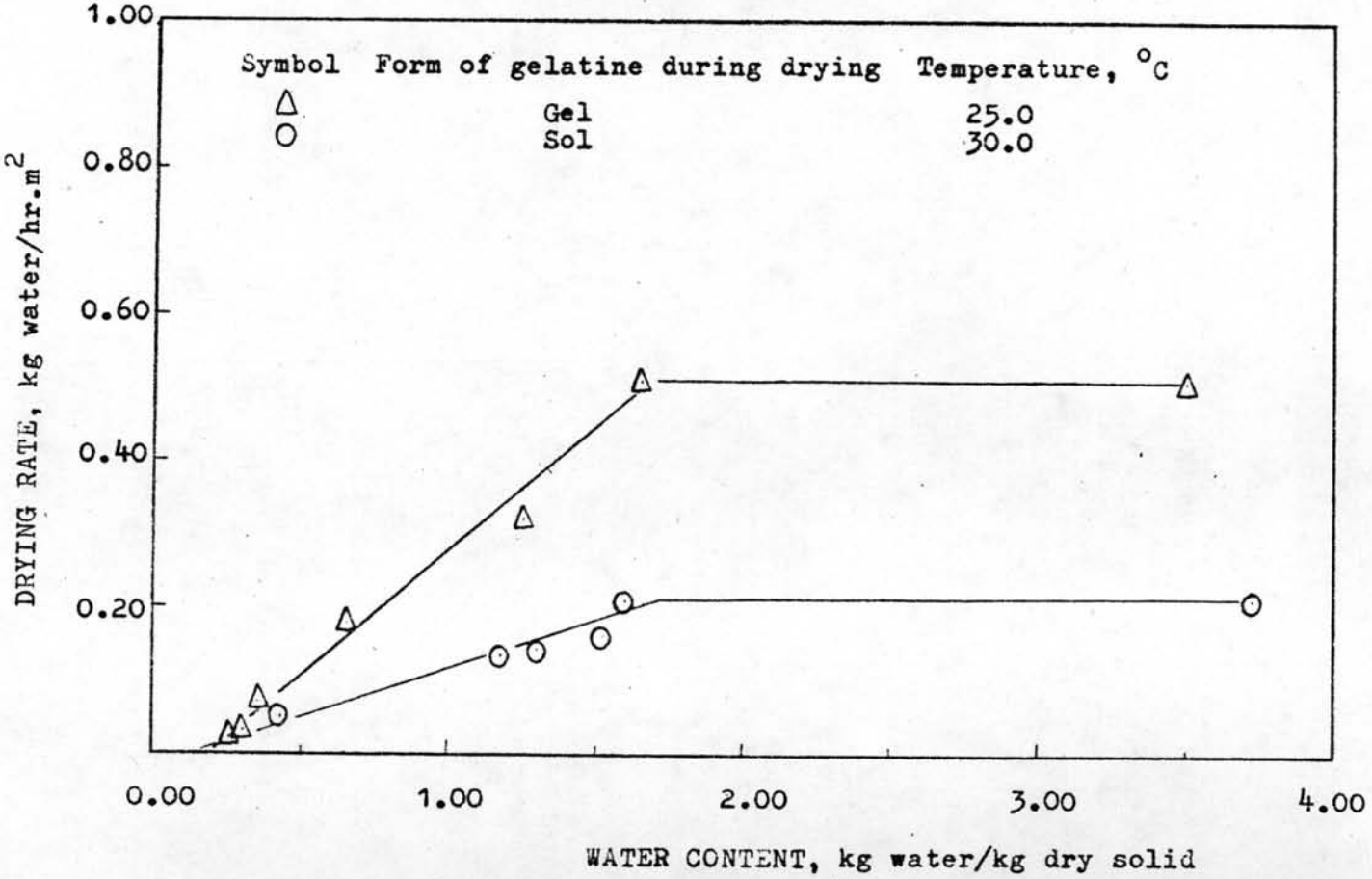

Figure 4.25 Drying Rate v.s water content at dry in Gel form and Sol form

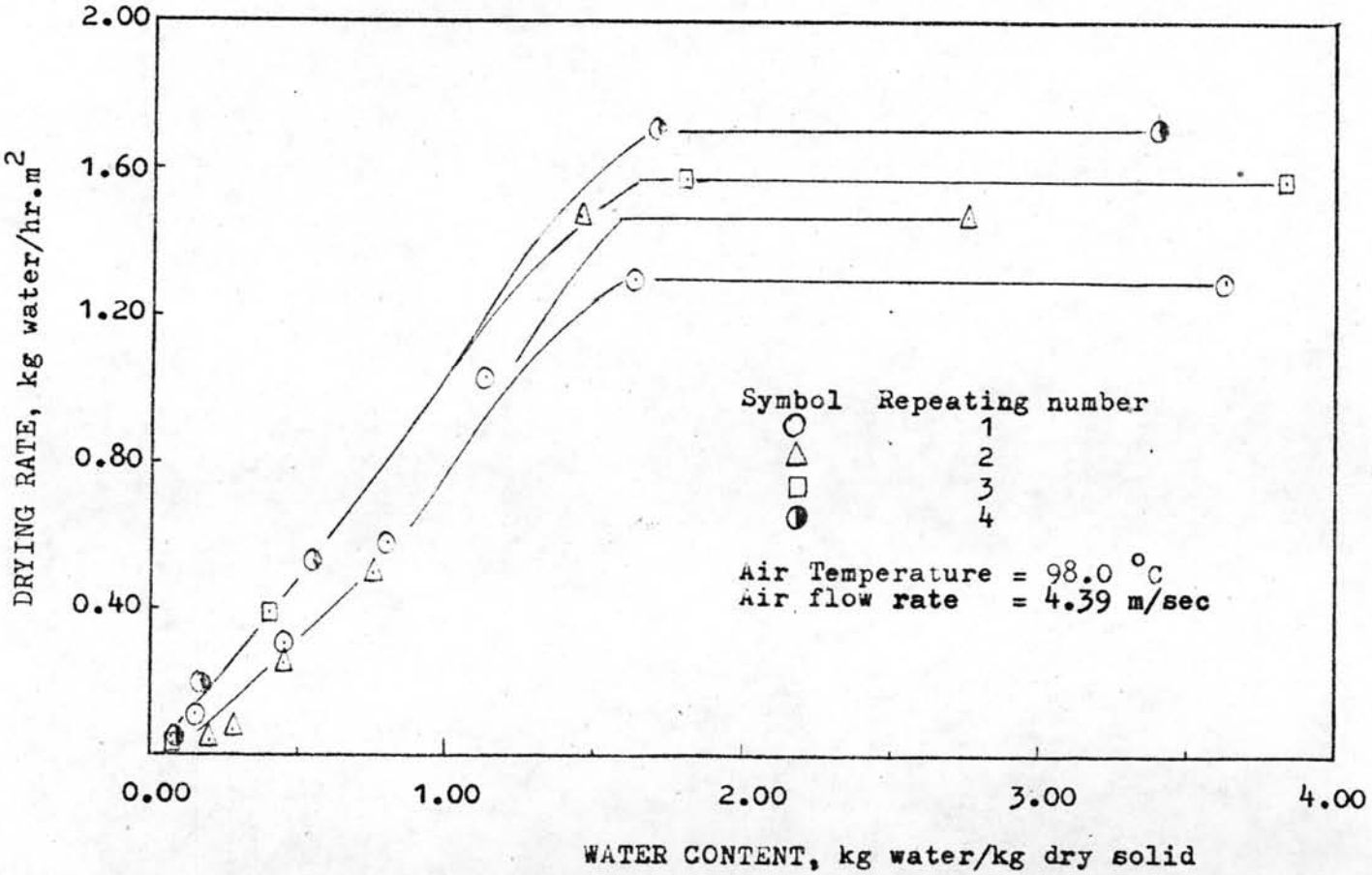

Figure 4.26 Drying Rate v.s water content at various repeating numbers

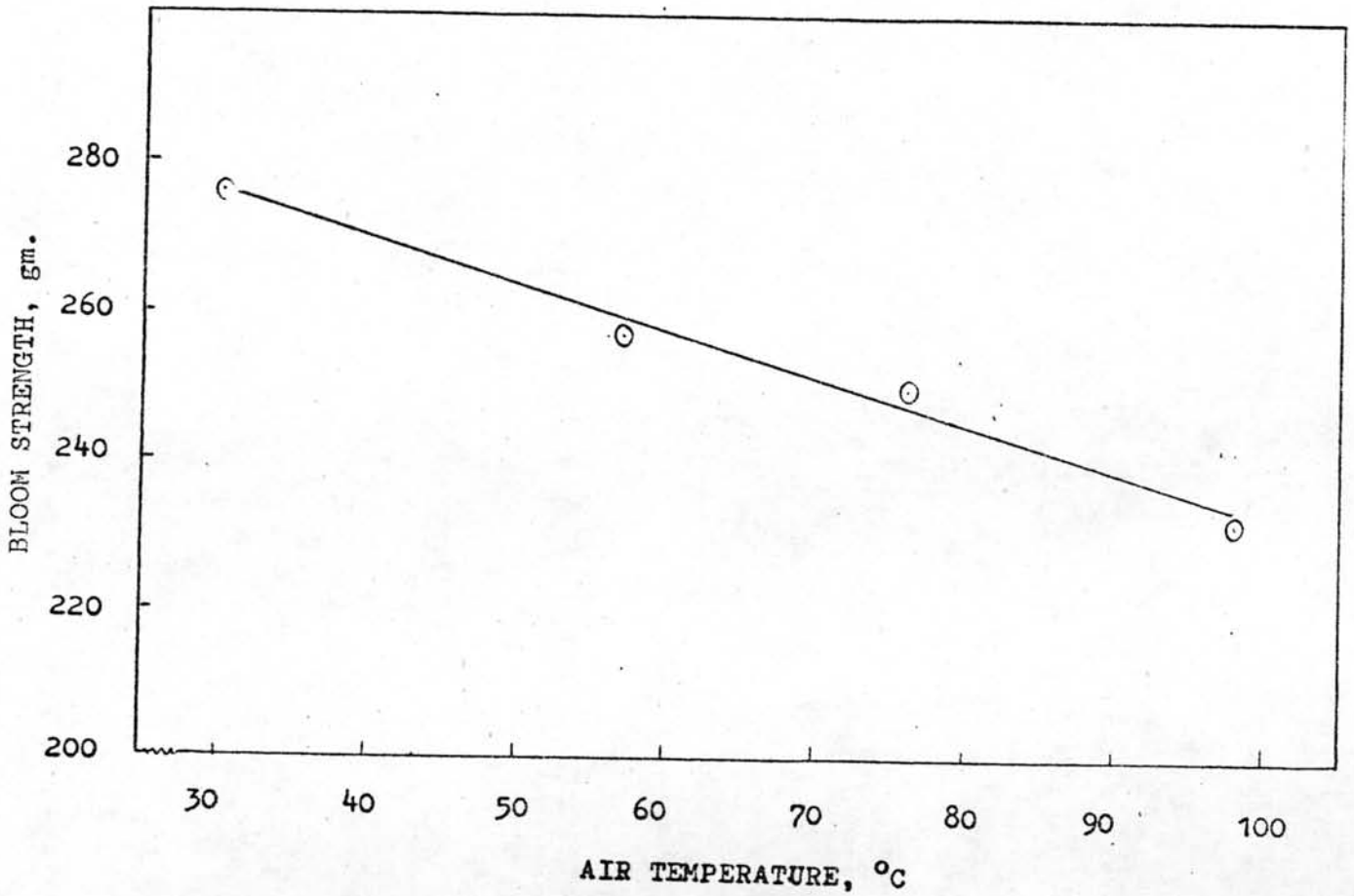

Figure 4.27 Bloom strength v.s air temperature

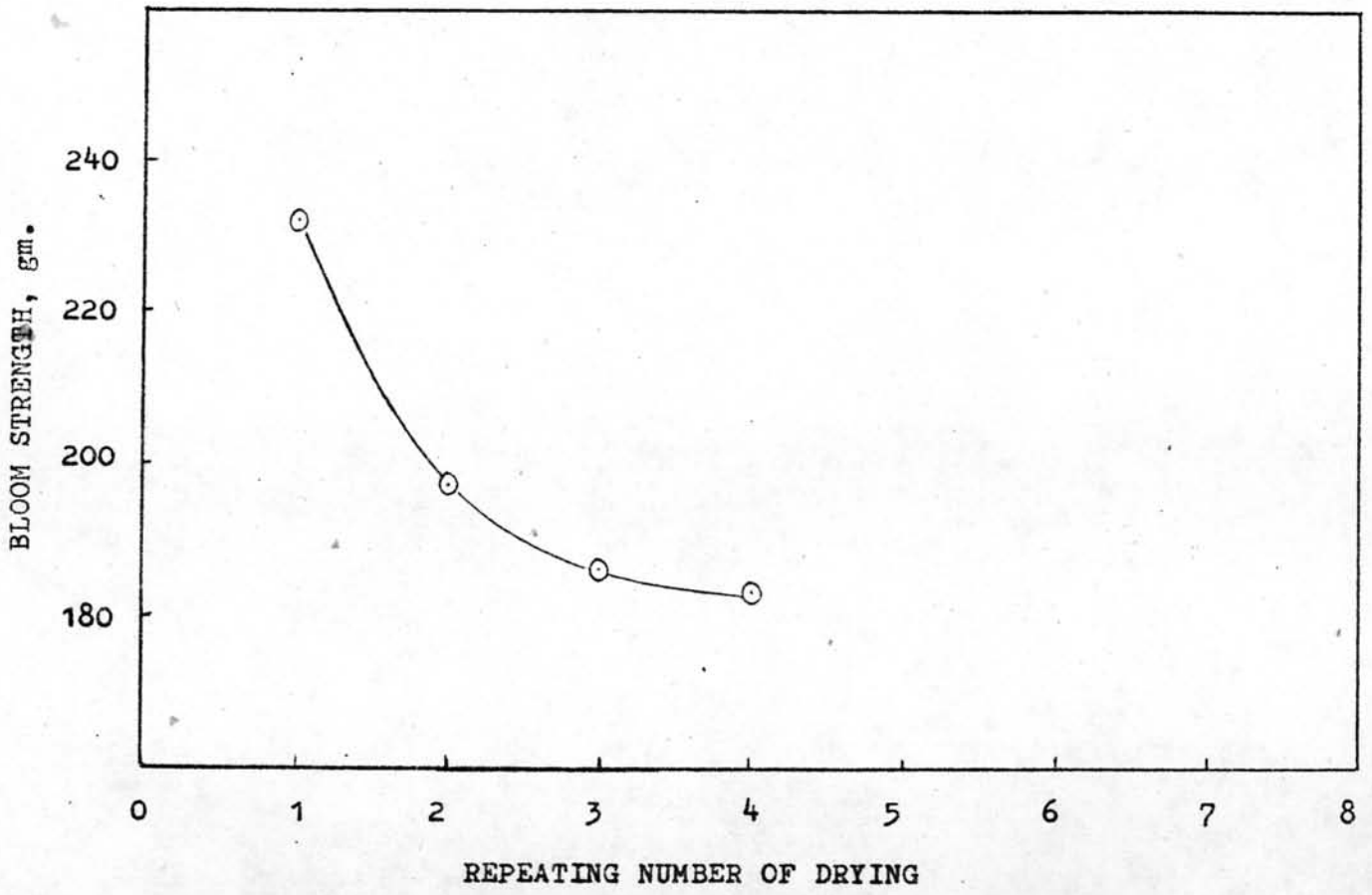

Figure 4.28 Bloom strength v.s repeating number of drying