Effect of drying methods on antioxidant capacity and phenolic compounds in nut grass tuber (*Cyperus rotundus* Linn.)

B. Mahayothee[1], K. Noypan[1], T. Thamsala[1], Y. Boonrod[2], P. Khuwijitjaru[1], S. Janjai[2]

[1]Department of Food Technology, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakhon Pathom 73000, Thailand, email: busarakornm@yahoo.com

[2]Department of Physics, Faculty of Science, Silpakorn University, Nakhon Pathom, 73000, Thailand. email: serm.janjai@gmail.com

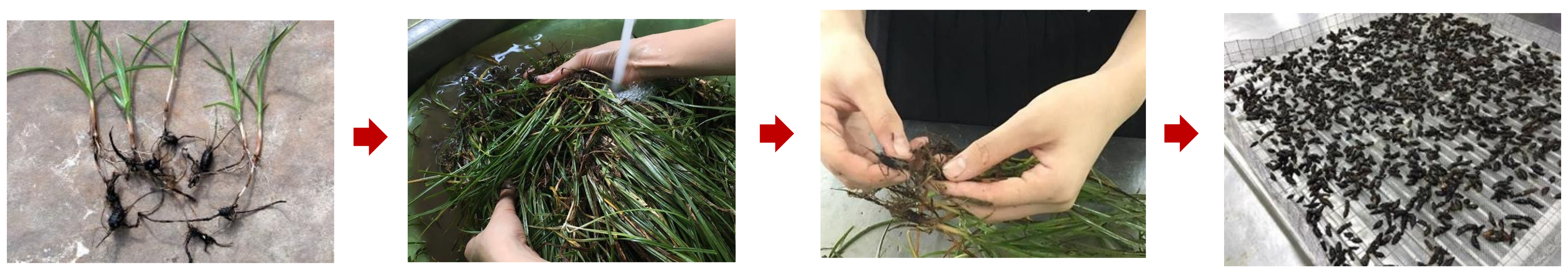
Department of Alternative Energy Development and Efficiency MINISTRY OF ENERGY

INTRODUCTION

Nut grass (*Cyperus rotundus* L.) is edible raw or cooked and incorporated in several Thai traditional medicinal formulae. It contains phenolic compounds and shows antioxidant activities (Kumar et al., 2014). Nut grass is usually dried by sun drying resulting in a low quality of product. The solar greenhouse dryer can prevent physical contaminations and decreasing of bioactive compounds comparing with open sun drying. This requires strong evident. In this study, nut grass tuber was dried using a solar greenhouse dryer and the total phenolic contents and antioxidant capacities were compared with sun and oven drying methods.

MATERIALS AND METHODS

Nut grasses were washed, separated and soaked in 100 ppm peroxyacetic acid solution for 10 min and then air dried at room temperature for 15 min.



Nut grass tubers samples were dried using a tray dryer at 50°C (A), Solar greenhouse dryer (B) and sun drying (C).

(A) (B) (C)

Temperature and relative humidity of drying air were recorded. Drying was performed until the moisture content and water activity of nut grass tubers was <13% and < 0.60, respectively.

Dried nut grass tubers

Moisture content (%), water activity, total phenolic contents (Folin-Ciocalteu method) and antioxidant capacity (DPPH assay and FRAP assay) of fresh and dried samples were determined.

RESULTS AND DISCUSSION

Drying behavior of the tuber in the tray dryer is shown in Fig. 1. The usual drying pattern was observed and well fitted with Page model with k value of 0.2257 hour^{-1} and n value of 0.6360.

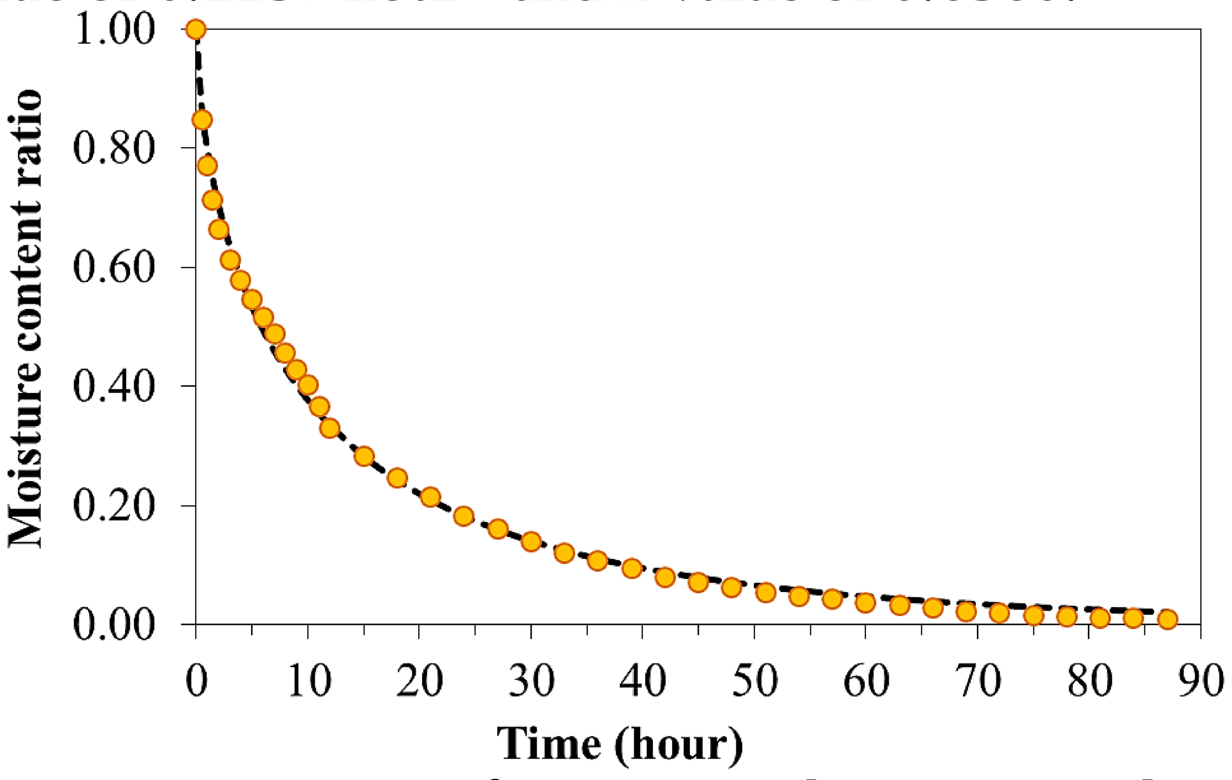


Figure 1. Drying curve of nut grass tuber in a tray dryer at 50°C

As shown in Figure 2, the temperatures in the solar greenhouse dryer were about 3-20°C higher than sun drying depended on the time of day while the relative humidity for solar dryer was lower than the sun drying. Table 1 shows that the drying time for tray dryer at 50°C was shortest among three drying methods.

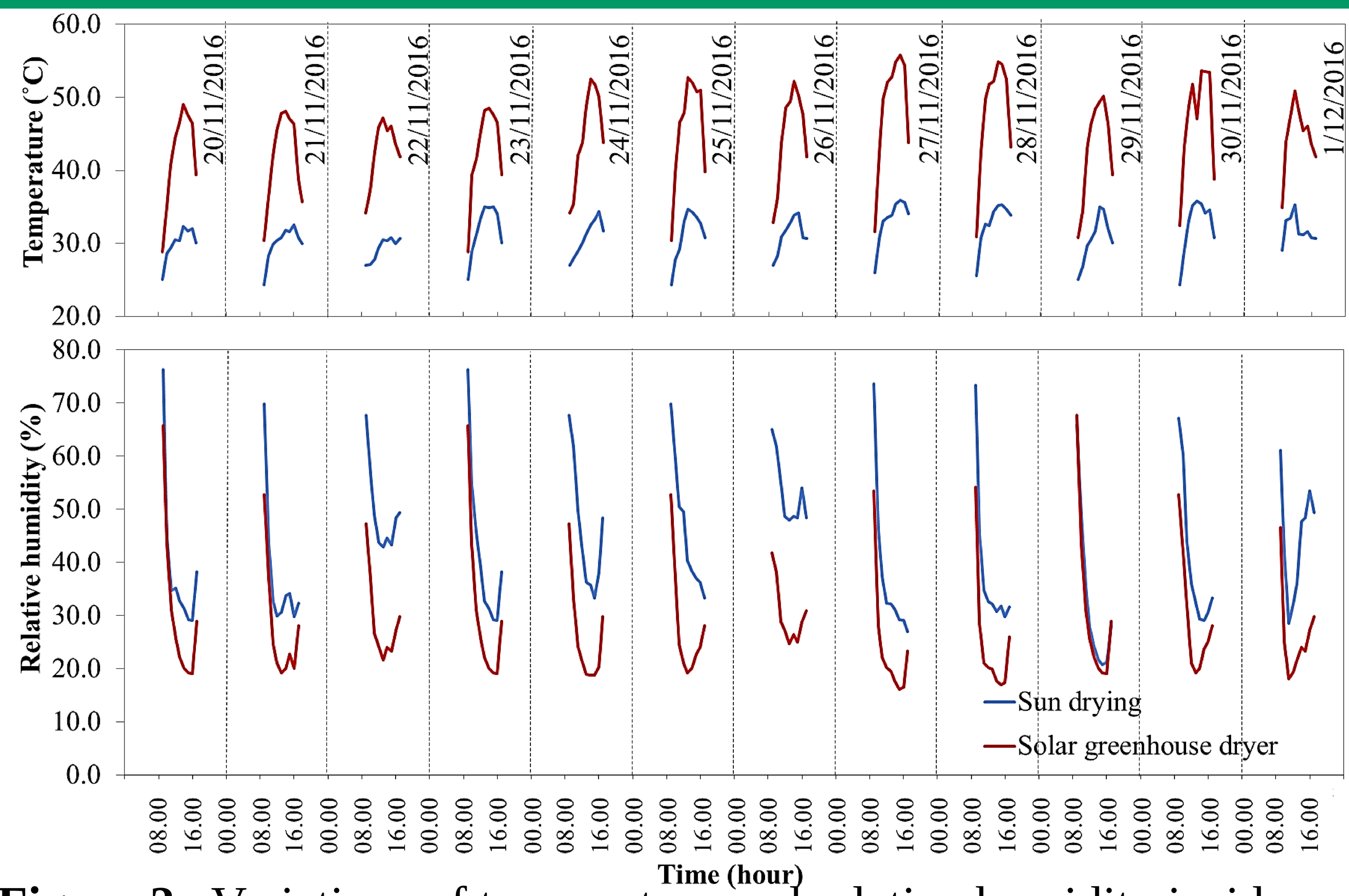


Figure 2. Variations of temperature and relative humidity inside and outside the solar greenhouse dryer.

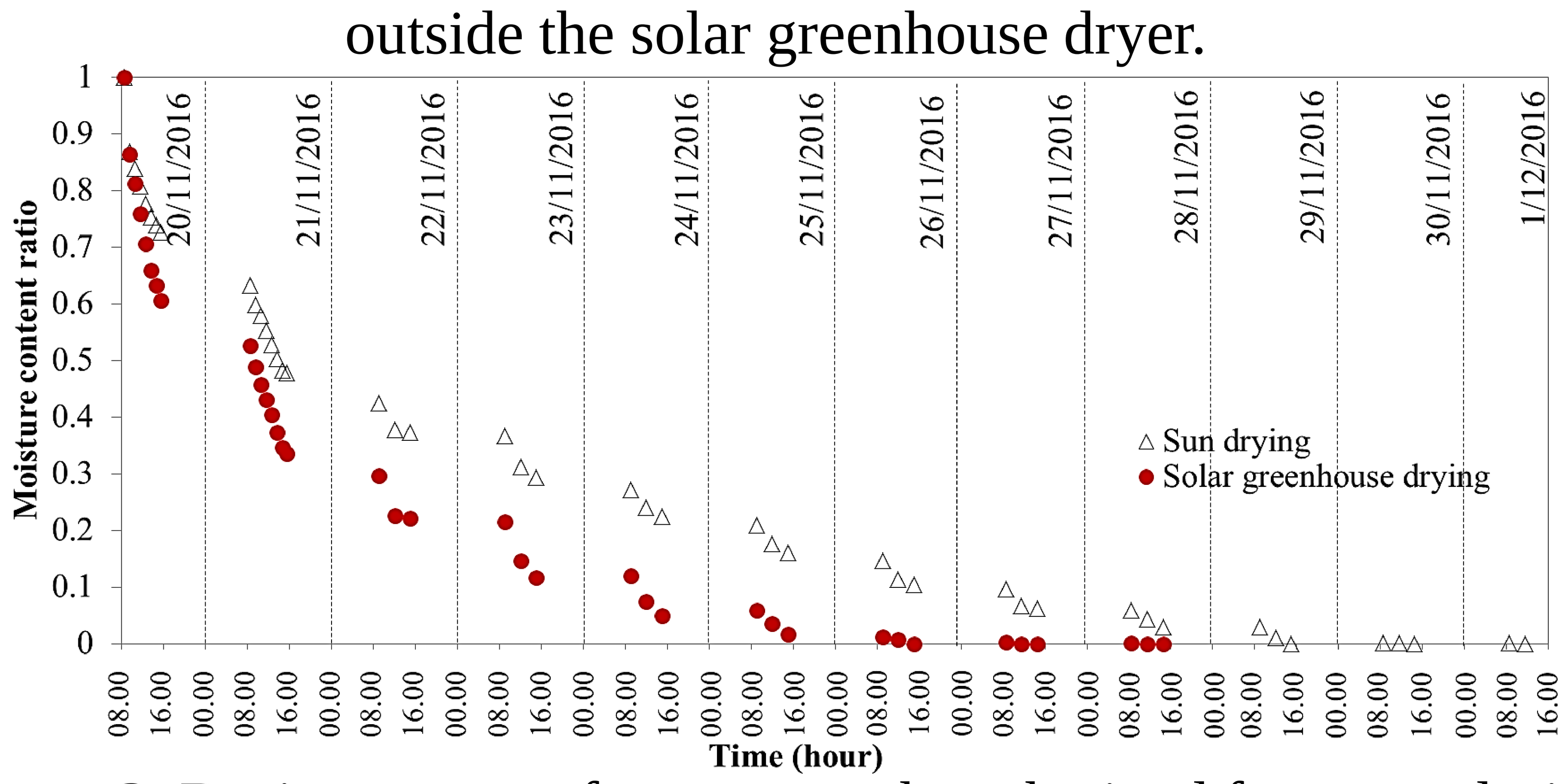


Figure 3. Drying curves of nut grass tuber obtained from sun drying and solar greenhouse dryer.

Table 1. Moisture content and water activity of fresh and dried nut grass tubers obtained from different drying methods

Drying methods	Drying time (h)	Moisture content (% w.b.)	Water activity
Fresh		55.91±0.27[a]	0.97±0.00[a]
Tray dryer at 50°C	87	9.55±0.16[b]	0.52±0.02[b]
Sun drying	267	13.34±0.68[b]	0.58±0.00[b]
Solar greenhouse dryer	199	8.72±0.15[c]	0.41±0.01[d]

Data are expressed as the mean value ± standard deviation. Different superscript letters indicate significant difference ($p \leq 0.05$) in the same column.

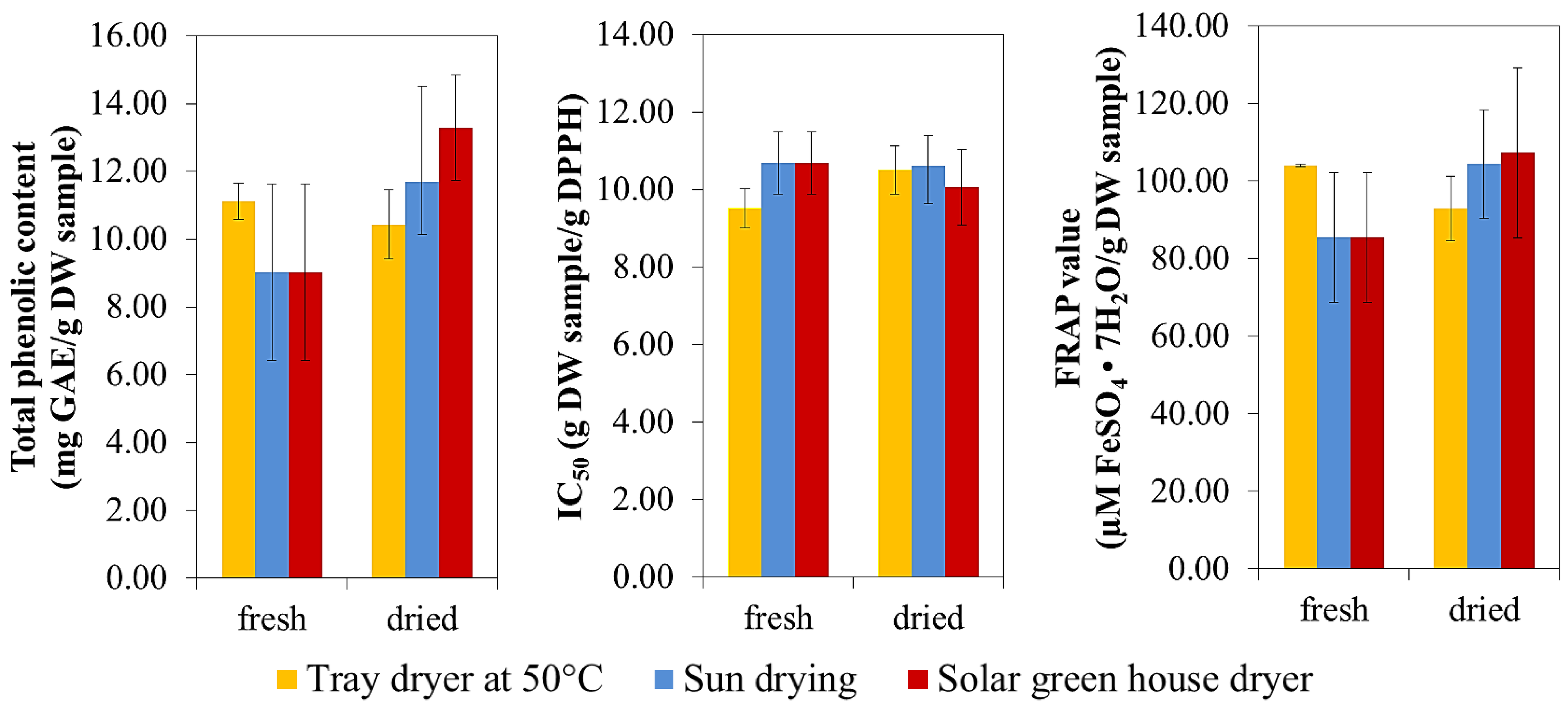


Figure 4. Total phenolic content (TPC) and antioxidant capacities of dried nut grass tuber.

CONCLUSION

Nut grass tuber can be dried using a solar greenhouse dryer without adverse effect while higher total phenolic contents and FRAP value was observed, however, solar greenhouse dryer shortened the drying time for 3 days.

ACKNOWLEDGEMENT

This research was funded by the Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand under the framework of the project "Development of the Greenhouse Solar Dryer for Drying Herbs".

REFERENCE

Kumar et al. (2014) Industrial Crops and Products, 52, 815–826..