



Annual International Training Course (AITC) 2023

The application of a parabolic greenhouse solar dryer together with raw material preparation techniques to extend shelf-life and enhance quality of agricultural products

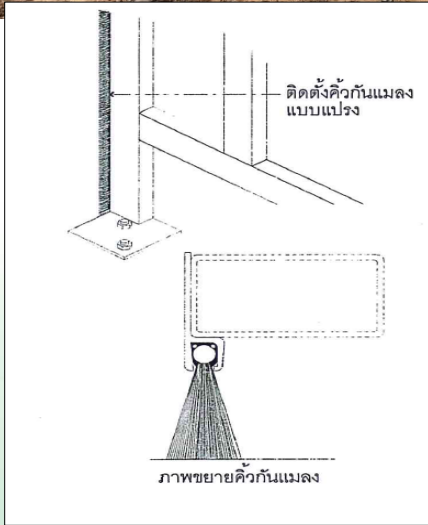
24 April – 5 May 2023





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A Parabolic Greenhouse Solar Dryer_ Structure





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A Parabolic Greenhouse Solar Dryer_ ventilation system





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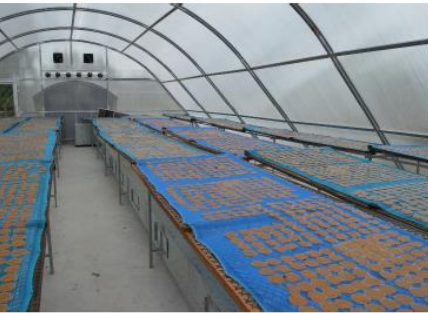
A Parabolic Greenhouse Solar Dryer_ it's competitive compared to other solar dryer





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A Parabolic Greenhouse Solar Dryer_dried fruits



ผลไม้อบแห้ง
Dried Fruits
(Natural)



“จากผลกล้วยที่เข้าศูนย์ได้มีรสชาติแตกต่างจากกล้วยตากธรรมดา เพราะใช้กระบวนการอบแห้งที่ทันสมัย... (Fruit House) ...”



ประกอบการที่ใช้ฟาราโบลาคาโดมอบแห้งผลไม้





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A Parabolic Greenhouse Solar Dryer_ osmotic dehydrated fruits



Dried jackfruit

BANKWAE BRAND





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Recipe with solar dried fruits





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Lecture 11_1st May 2023

Drying of vegetables, herbs and medicinal plants
using a parabolic greenhouse solar dryer

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THAI CUISINE

KHA (in thai) = Galanga

International website TasteAtlas named two Thai dishes among the best 10 soups in the world.

© April 18, 2023



TOM KHA SOUP

TOM YUM SOUP



ชุดต้มยำ

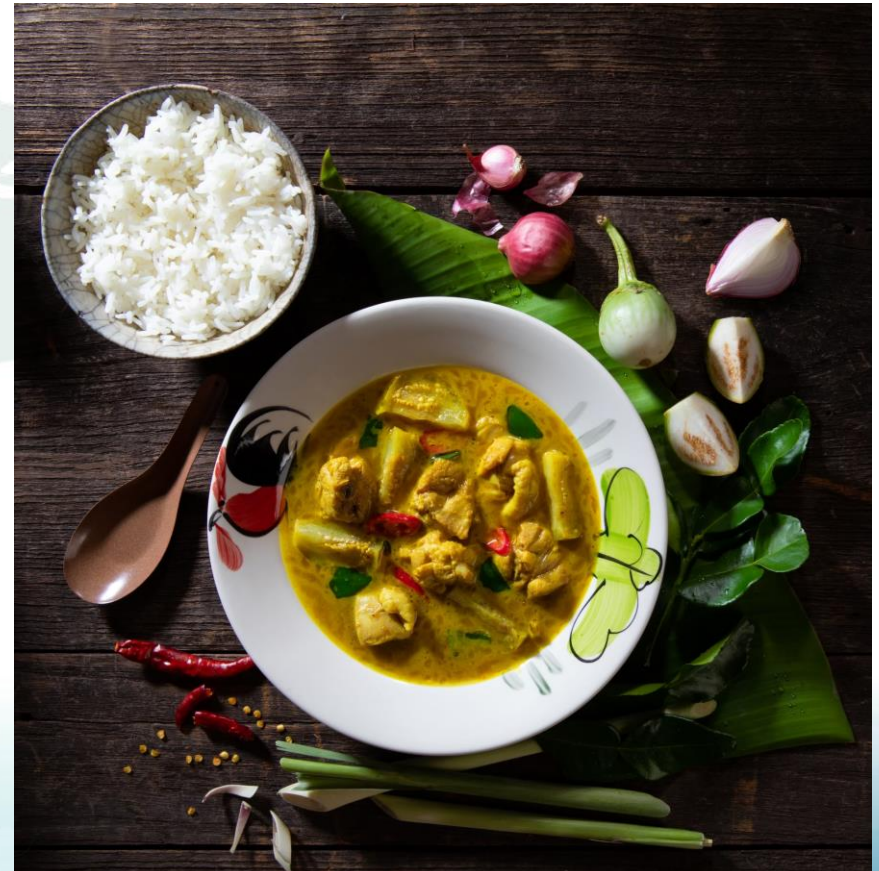


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THAI CUISINE



TOM YUM (SOUTH STYLE)



GREEN CURRY (SOUTH STYLE)¹⁰



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Commercial dried Thai herbs cuisine set





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Commercial dried Thai herbs





TICA
Thailand International
Cooperation Agency



80th Anniversary
SILPAKORN UNIVERSITY

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Commercial dried Thai herbs cuisine set





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THAI MASSAGE/ AROMA THERAPY



https://www.rama.mahidol.ac.th/altern_med/th/km/13may2020-1016



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MEDICINAL PLANT EXTRACT/ THAI TRADITIONAL MEDICINE



<https://www.uthaiprasit.com>





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HERB TEA



Lemongrass and Roselle





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Traditional drying herbs and medicinal plants in Thailand

Sun drying



Chilli



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Traditional drying herbs and medicinal plants in Thailand

Sun drying



Lotus flower



Butterfly pea flower¹⁸



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Traditional drying herbs and medicinal plants in Thailand

Sun drying



Black galingale



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Traditional drying herbs and medicinal plants in Thailand

Sun drying



Roselle



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Traditional drying herbs and medicinal plants in Thailand

Sun drying/ Tray drying

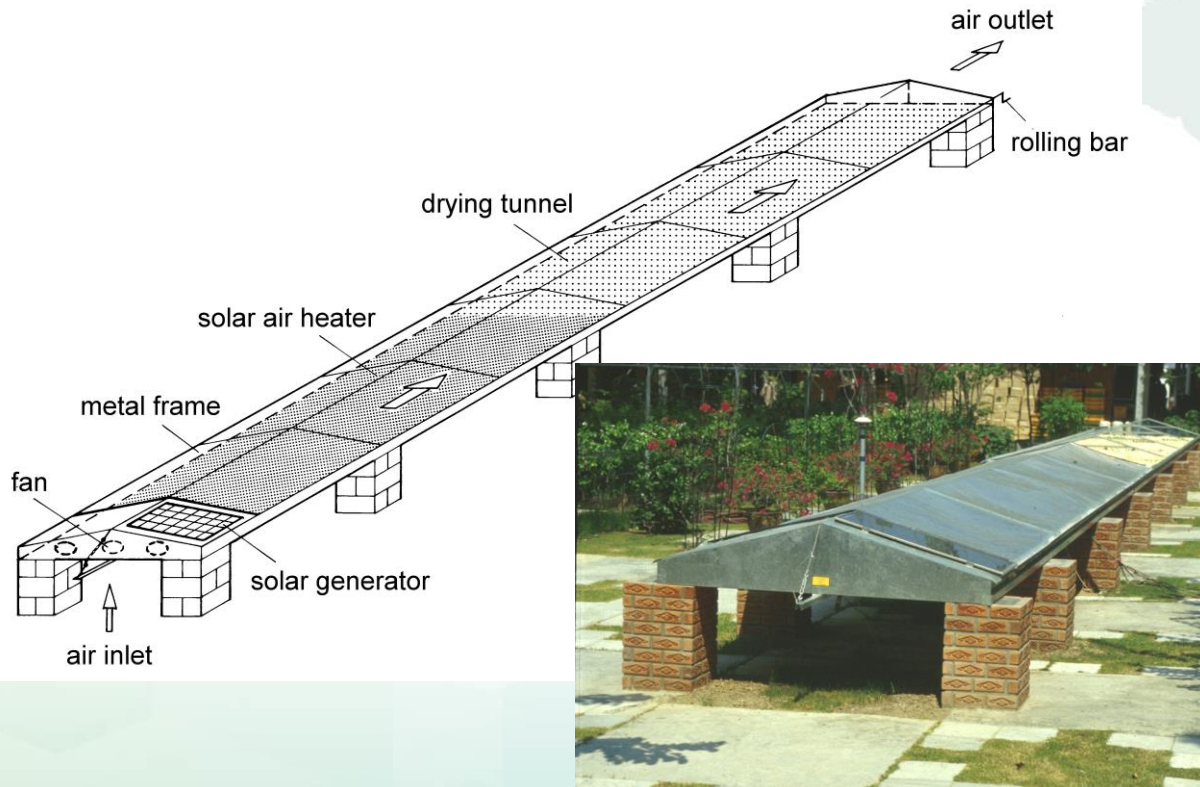




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Traditional drying herbs and medicinal plants in Thailand

Solar tunnel dryer





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Drying of herbs using a parabolic greenhouse solar dryer



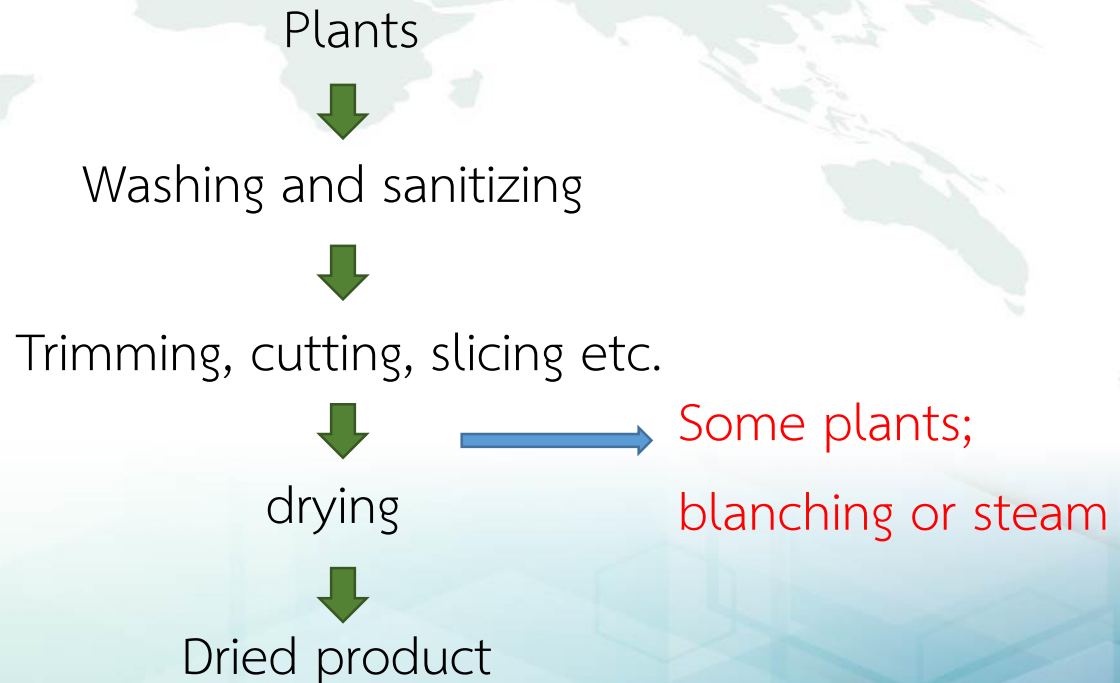
Dried chilli, garlic, galangal, turmeric for curry paste production 23



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Drying of herbs and medicinal plants using a parabolic greenhouse solar dryer

General Process





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Drying of medicinal plant using a parabolic greenhouse solar dryer

Black galingale (*Kaempferia parviflora*)



8-12 months after planting



Wash and slicing



Fresh

Moisture content ~ 75%

Water activity ~ 0.989





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Drying of medicinal plant using a parabolic greenhouse solar dryer

Black galingale (*Kaempferia parviflora*)



Solar Drying: drying time = 3-3.5 days or until moisture content (MC) less than 10%

Major bioactive compound: 5,7-dimethoxyflavone



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Black galingale (*Kaempferia parviflora*)

Color of dried product

Sun drying

Solar drying

 <p>No treatment</p>		
 <p>Steaming</p>		

Before drying

After drying

MC ~ 9-10 %
Water activity ~ 0.5-0.57



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Drying of Lotus flower using a parabolic greenhouse solar dryer





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Drying of Lotus flower using a parabolic greenhouse solar dryer



Drying time ~2 days



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Curcuma zedoaria (Christm.) Roscoe



Wash and brush



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Curcuma zedoaria (Christm.) Roscoe



Peel and slice



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Curcuma zedoaria (Christm.) Roscoe



Drying 2-3 days



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Traditional drying herbs and medicinal plants in Thailand

Sarcastic
catechu

Drying 1 week





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Traditional drying herbs and medicinal plants in Thailand





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Cassumunar ginger



Drying 2-3 days



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Kariyat (*Andrographis paniculata* Wall ex Ness.)



Maturity 3 months after seed planting



2 days in greenhouse solar dryer

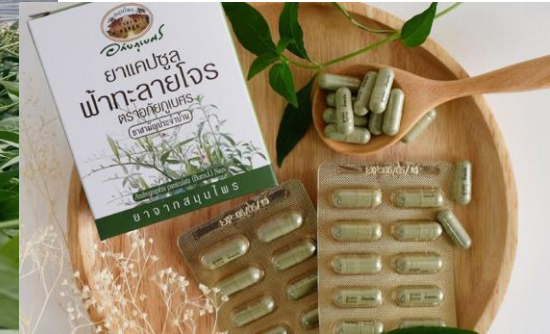


Herbal medicine against fever we are now using for healing the covid-19 at the beginning of symptom



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Drying Kariyat (*Andrographis paniculata* Wall ex Ness.)



2 days in greenhouse solar dryer



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Indian gooseberry



Drying 7 days



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Indian gooseberry ✓





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Drying of medicinal plant using a parabolic greenhouse solar dryer

Reishi mushroom



Wash



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Drying of medicinal plant using a parabolic greenhouse solar dryer

Reishi mushroom

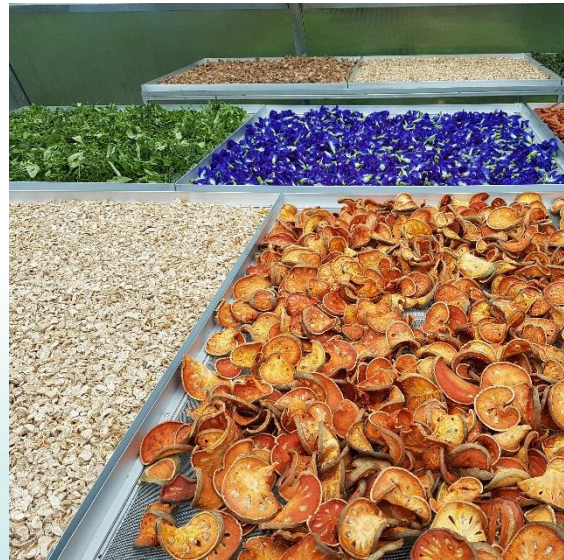


Drying 3 days





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Drying of medicinal plant using a parabolic greenhouse solar dryer

Bitter gourd



Deseeding





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Drying of medicinal plant using a parabolic greenhouse solar dryer

Bitter gourd



Drying time 2-3 days





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Drying of Kaffir lime leaves using a parabolic greenhouse solar dryer



Drying time 1 days



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Drying of Kaffir lime leaves using a parabolic greenhouse solar dryer



Blanching at 90°C for 3 min
and immediately cool down
In cold water 5 min





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Drying of chilli using a parabolic greenhouse solar dryer



Washing

Drying time 4-5 days



Dried chilli



Ground chilli



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Drying of chilli using a parabolic greenhouse solar dryer



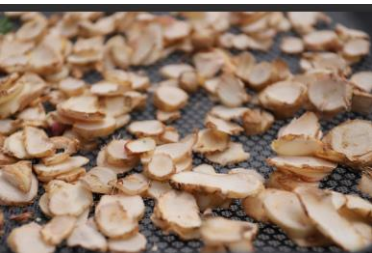
Drying time 4-5 days





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Drying of Galangal using a parabolic greenhouse solar dryer



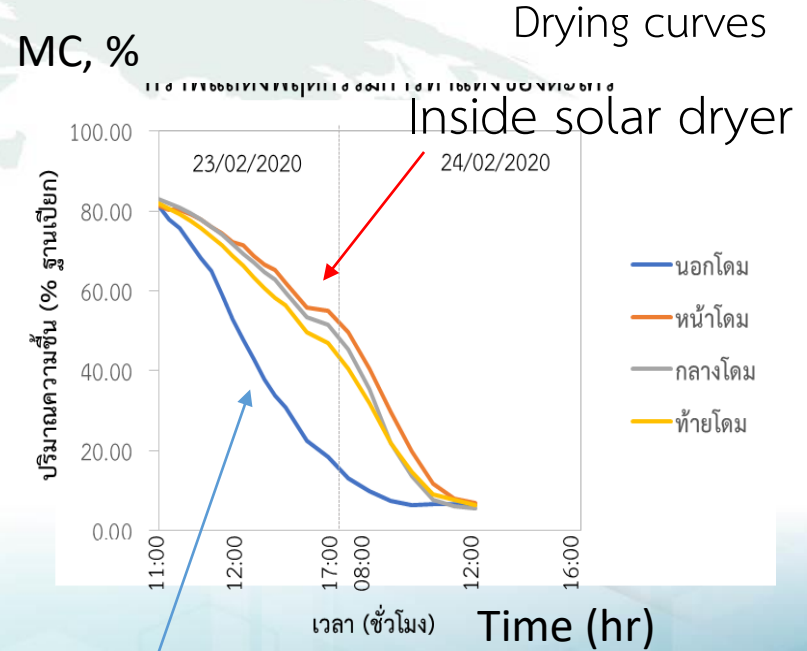
Drying time 2-3 days



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Drying of Herbs using a parabolic greenhouse solar dryer

Lemon grass





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Drying of Herbs using a parabolic greenhouse solar dryer

Lemon grass

various cutting styles





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Drying of Herbs using a parabolic greenhouse solar dryer

Lemon grass



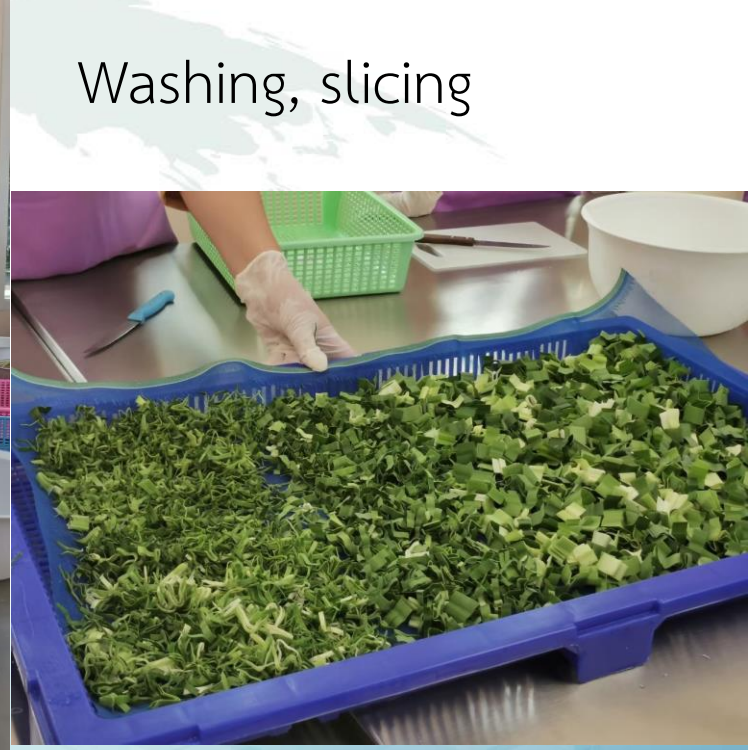
Drying time 1-2 days



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Drying of herbs using a parabolic greenhouse solar dryer

Pandan leaves



Washing, slicing



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Drying of herbs using a parabolic greenhouse solar dryer

Pandan leaves



Drying: drying time = 0.5 – 1 day



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Drying of herbs using a parabolic greenhouse solar dryer

Pandan leaves





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Drying of herbs using a parabolic greenhouse solar dryer

Stevia



Drying time = 1 day

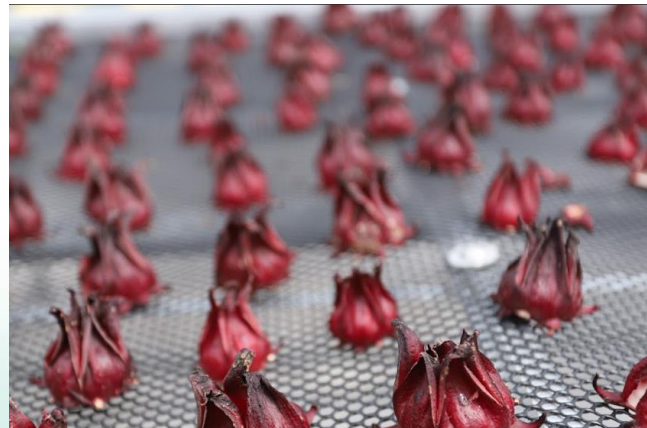




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Drying of herbs using a parabolic greenhouse solar dryer

Roselle



Drying time = 2 days



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Drying of herbs using a parabolic greenhouse solar dryer

Butterfly pea flower



Drying time = 0.5 days



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Drying of Herbs using a parabolic greenhouse solar dryer



Dried Indian marsh fleabane or *Pluchea indica* (L.)

Moisture content 10%

Water activity 0.55





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Drying of vegetables using a parabolic greenhouse solar dryer

Foam-mat drying





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Drying of vegetables using a parabolic greenhouse solar dryer

Foam-mat drying

Production of foam

Using

Foaming agents and

foam stabilizer





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Drying of vegetables using a parabolic greenhouse solar dryer Foam-mat drying





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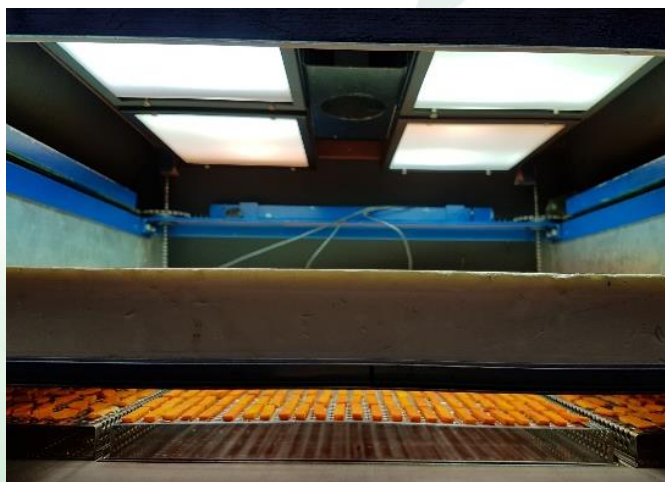
Drying of vegetables using a parabolic greenhouse solar dryer Foam-mat drying





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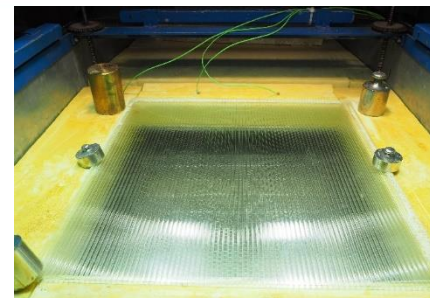
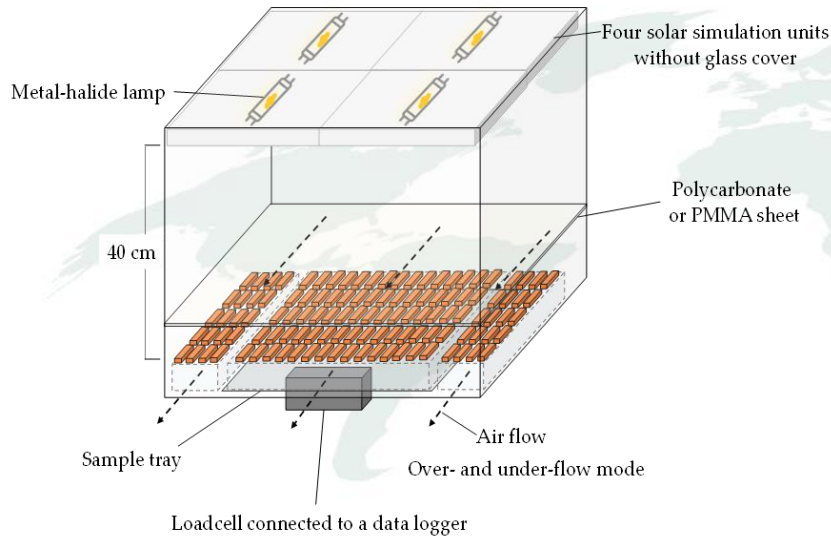
Nilobon Komonsing, Pramote Khuwijitjaru, Marcus Nagle, Joachim Müller, Busarakorn Mahayothee. (2022). Effect of drying temperature together with light on drying characteristics and bioactive compounds in turmeric slice. *Journal of Food Engineering* 317: 110695.



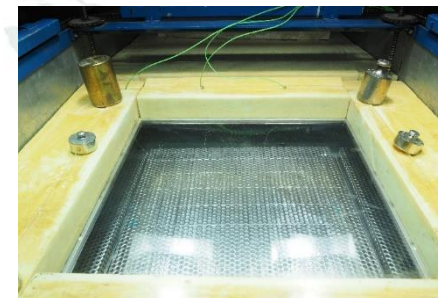


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Nilobon Komonsing, Sebastian Reyer, Pramote Khuwijitjaru, Busarakorn Mahayothee, and Joachim Müller. (2022). Drying Behavior and Curcuminoids Changes in Turmeric Slices during Drying under Simulated Solar Radiation as Influenced by Different Transparent Cover Materials. *Foods* 11: 696.



Polycarbonate sheet



PMMA sheet





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THANK YOU FOR YOUR ATTENTION



At Silpakorn University, Nakhon Pathom Campus, Thailand