

## Solar food processing in Mediterranean Algarve

Nídia Braz \*

University of Algarve, CESUAlg - Center for Research and Development in Health  
Av. Dr. Adelino da Palma Carlos, 8000-510, Faro, Portugal  
e-mail: nbraz@ualg.pt, web: <http://www.ualg.pt>

**Abstract:** Algarve shares a lot in common with Mediterranean coastal communities, even though the sea on Algarve's coast is the Atlantic Ocean. This is emphasized by the recent UNESCO recognition of the Mediterranean Diet as World Intangible Heritage, including Portugal, represented by Tavira, as one of the seven countries where this way of living is practiced at present. Food raw materials, food processing and culinary practices are very similar among these communities, and so are their vegetable gardens, barns and kitchens.

Mediterranean Diet is a lifestyle, where physical activity is always present, life pace follows Nature's rhythms and food traditions include social gatherings and festivities.

In the Algarve, beyond the so-called Mediterranean triad – bread, olive oil and wine, food traditions include abundant consumption of fresh fruit and vegetables, dried fruit and nuts, cheese and fish.

Food processing methods based on solar energy are used here since the earliest historical records. Sea-salt, produced by evaporation of water from flat man-made tanks, is used to preserve, through dehydration, fish products since the Roman Empire occupation – Romans produced *garum*, at present anchovies are produced in a very similar way.

Sun drying of fish was a very popular fish preserving technique before refrigeration became available, but is still used today, to produce highly prized fish products appreciated by its sensorial attributes, such as *litão* (a small shark common in the Mediterranean). Muxama (dried tuna loins) and estupeta (tuna in brine) are products whose characteristics depend on the dehydration caused by salt.

Sun drying is also the basis of dried fig preparation – while figs are highly perishable fruits, they ripe in summer and may be transformed into a stable commodity, with a long shelf-life, through a laborious, time consuming process, which depends of the large hours of sun available each day, combined with the low atmospheric humidity during the summer months.

Bearing in mind that the traditional cuisine in the Algarve uses a wide variety of recipes where vegetables and some meat are slowly cooked with water in a pot, and that the number of sunny days is very large, the use of solar thermal processing is highly applicable and recommendable, contributing to the increase of Mediterranean Diet adherence, better consumer health and resource economy.

**Keywords:** Food, Mediterranean, Solar, Thermal, Food processing

## 1. INTRODUCTION

Algarve is the most southern region of Portugal; its coast faces the Atlantic Ocean, both in west and south, but Mediterranean Sea begins very close to Algarve's eastern end. In spite of its Atlantic shores, Algarve population shares a lot in common with Mediterranean coastal communities.

This fact was emphasized by the recent UNESCO recognition of the Mediterranean Diet as World Intangible Heritage, including Portugal, represented by the city of Tavira, as one of the seven countries where this way of living is practiced at present.

Food raw materials, food processing and culinary practices are very similar among these communities, and so are their vegetable gardens, orchards, vineyards, barns and kitchens.

Mediterranean Diet, as defined by UNESCO, is a lifestyle, where physical activity is always present, life pace follows Nature's rhythms and food traditions include social gatherings and festivities [1]. World Health Organization also considers this eating pattern to be health promoter, thus encouraging its adoption to enhance quality of life [2].

In the Algarve, beyond the so-called Mediterranean triad – bread, olive oil and wine, food traditions include abundant consumption of fresh fruit and vegetables, dried fruit and nuts, cheese and fish [3].

In spite of sharp climate changes throughout the seasons, long sunlight hours are always present in the Algarve. Winter is mild and summer is hot, conditioning seasonal changes in agricultural production and fisheries [4,5].

This rich production of some food resources during one season, compared with their scarcity in other periods, has promoted ingenious food preservation techniques since ancient times, particularly those using the most abundant resources: salt and sun.

For instance, fig drying is an ancient technique, common to many other Mediterranean shore areas, which uses the dehydrating power of hot dry air, in order to transform a highly perishable fruit, as it is the fresh fig, into a dry, highly caloric and stable food product, rich in sugars and fibre, which can be stored at room temperature for months.

This drying process uses no more than solar energy and hand labour – to pick, to lay, to dry, to protect from night moisture, and finally, to shape it and pack the end-product (Fig.1, 2).



Figure 1. Sun-drying figs.



Figure 2. Fig press and packed dried figs [6]

Olives are prepared in many different ways in the Algarve, from simple salting with dry salt, which preserves dry olives, so salty that they need to be soaked before consumption, to the more elaborated processes which involve fermenting in brine, seasoned with lemon, garlic and different herbs.

Sea salt is also used to prepare pepper paste, a popular condiment, which combines red ripe sweet peppers with salt and is indispensable for many meat preparations.

Meat is not so popular in Algarve's traditional kitchens, but pork meat was traditionally cured in salt to prepare dry *presunto*, while *chouriças* and *linguiças* were prepared using brine and smoke curing.

Many fish species are also only available at different seasons, according to species migrations

in and out the Mediterranean, and lifecycles; on the other hand, up to the middle of the XX<sup>th</sup> century, fresh fish could only reach 20 or 30 km inland. By that time, inland populations used to eat sun-dried fish, prepared using methods that date back to the Roman Empire occupation. For the same reasons, fish canning factories flourished in the Algarve's seaside ports and harbours, preserving tuna, sardine and mackerel in the periods of abundance, providing food and income during the scarcity months.

Nowadays, fish drying and canning are no longer important as preservation methods, since refrigeration and freezing assure all year supplies, but they are still very important because their products are highly prized for their characteristic sensory attributes – that is the reason why *muxama*, *estupeta* and anchovies are still produced using ancient techniques.

Traditional food in the Algarve consists of a food consumption pattern that respects environment and neighbourhood, where food is eaten frugally, at the pace Nature provides it. It consists of the consumption of large quantities of vegetables and fruit – with fig and orange at the top of the list, dry fruits, such as almonds and nuts, but also dried fruit, such as dried figs and raisins, and of bread, olives, olive oil, wine, fish and shellfish, little meat (poultry, small game, pork), some goat cheese. Cooking is simple, ordinary days are quite different from holydays and festivities.

Traditionally, during ordinary, working days, food ingestion is frugal, with vegetable predominance, accompanied by small portions of fish, meat, meat products or poultry. Wine was diluted with water and sugar was only present when naturally occurring in ripe fruits – fresh or dried. At present, we can still find elderly who recall working from sunrise to sunset after a light morning meal, relying on a handful of figs or olives and some bread for calorie supply during the day, to come back home in the evening and eat a pot of hot vegetables boiled in water.

Holidays and festivities involve social gatherings around rich meals, filled with sweets, where almonds, figs and honey are major ingredients. Main courses are more abundant in either fish or meat, but cooking remains simple and continues to depend on boiling, roasting or grilling [7].

## **2. SOLAR THERMAL FOOD PROCESSING**

In the Algarve, the number of sunny hours per day is extremely high, and even during winter months, it often reaches values above 250MJ/m<sup>2</sup> in Faro [8].

Taking into consideration that boiling is an important feature of traditional Algarve's cooking, and also that boiled meals are part of the health promoting food pattern described as Mediterranean Diet, there is an evident growing interest in the use of solar thermal food processing units to prepare them, since boiling temperatures can be quickly obtained using

simple and inexpensive equipment [9, 10,11].

The promotion of healthy cooking and culinary practices, designed to increase healthy food consumption habits including the preparation of *sopas*, *cataplanas*, *caldeiradas*, *cozidos* and *jantares*, which are the most relevant representatives of soups, stews and boiled food from the Algarve, should convey the methodology of solar thermal food processing, using solar funnel cookers in the workshops, as it happens in some educational projects involved with the promotion of ecology, sustainability and Mediterranean Diet, already in practice (Fig. 3, 4).

**Materials:**

- Black pan with lid
- Plastic or glass cover/wrap
- Honeycombed polypropylene
- Reflective film to cover the inside of the polypropylene structure

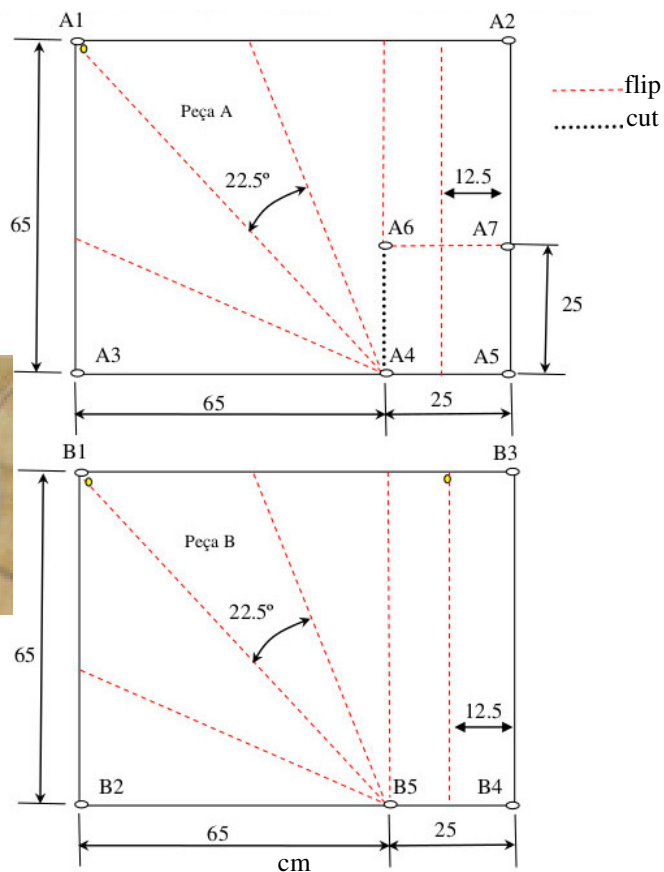


Figure 3. Instructions for building a solar funnel cooker (adapted from [11])



Figure 4. Baking a cake using a solar funnel cooker [12])

Solar drying equipment has been successfully developed and tested over many years [13] but, for the home culinary herb drying, and also for the drying of small fruit, such as cherry tomatoes, grapes and diced peaches or prunes, the same solar thermal funnel equipment used for cooking may be used, with little training.

### 3. CONCLUSIONS

The adoption of solar cooking may become both an ecological and economical allied in Mediterranean home cooking, decreasing energy costs and making available low cost healthy cooking options.

Solar cooking and food drying, using simple and inexpensive solar funnel cookers may become an useful solution to increase Mediterranean Diet adherence in Algarve, thus improving Public Health, at the same time as ecological sustainability.

On the other hand, industrial food drying practices could benefit from the use of solar thermal drying – although open-air solar exposure is enough for the efficient drying of figs, grapes and other fruit, such as peaches and prunes, the use of those devices could cut down labour costs and production time, thus making such productions more cost effective and rewarding.

## REFERENCES

- [1] <http://www.unesco.org/culture/ich/en/convention>, accessed on 2016.01.05.
- [2] World Health Organization. Regional Office for the Eastern Mediterranean □ Promoting a healthy diet for the WHO Eastern Mediterranean Region: user-friendly guide. 2012. ISBN: 978-92-9021-836-4 (online).
- [3] FREITAS, A; BERNARDES, JP. MATEUS, MP & BRAZ, N (ED.) Dimensões da dieta mediterrânica, património imaterial da Humanidade, Faro, Universidade de Algarve, 2015.
- [4] RIBEIRO, O. Portugal, o Mediterrâneo e o Atlântico, Lisboa, Sá da Costa, 1998.
- [5] RIBEIRO, O. Mediterrâneo, ambiente e tradição. Lisboa, F. C. Gulbenkian, 2011.
- [6] <http://www.quinta-da-fornalha.com/>, accessed on 2015.01.05.
- [7] VALAGÃO, MM. CÉLIO, V. & GOMES, B. Mediterranean Algarve: Tradition, Produce and Cuisine. Lisbon, Edições Tinta-da-china, 2015.
- [8] IPMA Boletins Climatológicos <http://www.ipma.pt/pt/publicacoes/boletins.jsp>, accessed on 2016.01.07.
- [9] Guerreiro, D. Solar Chef. Eco 123 Newsletter. 2015.09.21, accessed on 2016.01.10.
- [10] Jones, SE. The Solar Funnel Cooker, How to Make and Use The BYU Solar Cooker/Cooler. Solarcooking.org, accessed on 2016.01.10.
- [11] <http://lura-aprendernaturalmente.blogspot.pt/2016/01/cozinha-solar-uma-alternativa-saudavel.html>, accessed on 2016.01.15.
- [12] <http://figueiraminha.blogspot.pt/2015/08/encontro-com-cozinha-solar.html>, accessed on 2016.01.19.
- [13] <http://teca.fao.org/read/4502#sthash.vlKiFupp.dpuf>. Dryer construction for solar-dried fruit and vegetables production, accessed on 2016.01.08.