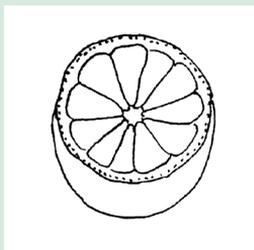


# Preservation of fruit and vegetables



# **Agrodok 3**

## **Preservation of fruit and vegetables**

Ife Fitz James  
Bas Kuipers

This publication is sponsored by: KERKINACTIE

KERKINACTIE attaches high priority to rural development in its work, and supports organisations active in this field. Agriculture and food production are activities of vital importance in rural areas. Kerkinactie supports this kind of work directly and also indirectly providing support for the collection, compilation and spread of information and knowledge.

© Agromisa Foundation, Wageningen, 2003.

*All rights reserved. No part of this book may be reproduced in any form, by print, photocopy, microfilm or any other means, without written permission from the publisher.*

First edition: 1984

Second revised edition: 1990

Third revised edition: 1997

Fourth, completely revised edition: 2003

Authors: Ife Fitz James, Bas Kuipers

Editor: Bas Kuipers

Illustrator: Mamadi Jabbi

Translation: Catharina de Kat-Reynen

ISBN Agromisa: 978-90-77073-30-8

# Foreword

This Agrodok is meant to be a practical manual giving a review of the simple techniques used to preserve fruits and vegetables.

In addition to information provided in the previous edition of this Agrodok, this fourth edition covers more theoretical information on food decay in general, its causes and dangerous effects, as well as preventive measures that can be taken. In our opinion this knowledge is necessary if you want to start a small-scale preserving business, to which a whole chapter is devoted in this edition.

The general introduction deals with the principles of spoilage prevention. The various methods of preserving are then explained, and the main points of spoilage specific to the method are covered. The next chapters deal with jam and juice making and attention is paid to drying vegetables and fruit, as well as salting of vegetables. Freezing is not discussed, since this technique needs facilities usually not available in many developing countries. We have tried to describe every method as practically as possible, including descriptions of the required materials and techniques.

Finally we would like to thank some people for their contributions to the realization of this Agrodok: Domien Bruinsma for writing chapter 8 and critically reading the different concepts, Jan Schreurs for text editing, Mamadi Jabbi for making some new illustrations and Willem Würdemann for critically reading the content of this Agrodok.

Ife Fitz James

Bas Kuipers

# Contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
<b>2</b>	<b>Food spoilage: causes, effects and prevention</b>	<b>8</b>
2.1	What is food spoilage?	8
2.2	What are micro-organisms, and what factors affect their growth?	10
2.3	What do micro-organisms do to fruits and vegetables?	12
<b>3</b>	<b>Preparation</b>	<b>15</b>
3.1	Cleaning and washing	15
3.2	Lye dip	15
3.3	Sorting	16
3.4	Peeling	16
3.5	Cutting	16
3.6	Blanching	17
<b>4</b>	<b>Preserving by heating</b>	<b>19</b>
4.1	Introduction	19
4.2	Packing	20
4.3	Preparation	23
4.4	Three types of heating	24
4.5	Storage and consumption	29
<b>5</b>	<b>Drying</b>	<b>31</b>
5.1	Quality of the fresh product	32
5.2	Preparation	32
5.3	Drying methods	34
5.4	When is the drying process finished?	40
5.5	Packing and storage	40
5.6	Consuming dried products	41
5.7	Three examples	42

<b>6</b>	<b>Preserving vegetables with salt and/or vinegar</b>	<b>44</b>
6.1	Preserving with salt	44
6.2	Requirements for salting	48
6.3	Preserving in vinegar	49
<b>7</b>	<b>Jam and juice making, syrups, jellies and candied fruit</b>	<b>51</b>
7.1	Making fruit juices	52
7.2	Preparation of other fruit products	58
<b>8</b>	<b>Developing a small-scale food processing enterprise</b>	<b>61</b>
8.1	Marketing a fresh or processed product	62
8.2	Organizing a processing enterprise	64
	<b>Further reading</b>	<b>68</b>
	<b>Useful addresses</b>	<b>70</b>
	<b>Appendix 1: Pasteurization of fruits and vegetables</b>	<b>72</b>
	<b>Appendix 2: Sterilization in a boiling water bath</b>	<b>74</b>
	<b>Appendix 3: Sterilization in a pressure cooker or autoclave</b>	<b>76</b>
	<b>Appendix 4: Preparation and drying conditions</b>	<b>79</b>
	<b>Appendix 5: Preparation of vegetables for salting</b>	<b>83</b>
	<b>Appendix 6: Juice extraction methods</b>	<b>84</b>
	<b>Glossary</b>	<b>86</b>

# 1 Introduction

All living creatures, including humans, depend on nature for their food. Humans are not only hunters and gatherers, but also farmers. We live from hunting and fishing, agriculture and animal husbandry. Most of our food consists of agricultural products, which are usually seasonal and spoil quickly. To make food available throughout the year, humans have developed methods to prolong the storage life of products: to *preserve* them. The rotting process can be postponed by adding preservatives, optimizing storage conditions, or applying modern techniques. The last option will not be discussed in this Agrodok. This booklet focuses on the traditional preservation methods still commonly used in developing countries for fruits and vegetables.

Fruits and vegetables provide an abundant and inexpensive source of energy, body-building nutrients, vitamins and minerals. Their nutritional value is highest when they are fresh, but it is not always possible to consume them immediately. During the harvest season, fresh produce is available in abundance, but at other times it is scarce. Moreover, most fruits and vegetables are only edible for a very short time, unless they are promptly and properly preserved.

This Agrodok will focus on a few simple and relatively inexpensive preservation techniques that can be applied on a small scale by an individual or a small group (of families for example). Chapter 2 provides information on food spoilage in general, its causes and dangerous effects, as well as measures that can be taken to prevent it. Specific knowledge is needed to apply the right preservation methods. Fruits and vegetables have to be specially prepared, for example, before they can be preserved. How this is done is explained in Chapter 3. Chapters 4 to 7 describe the various preservation methods: heating, drying, and the use of additives such as salt and sugar. In times of scarcity, preserved food can be sold for a good price. It can even be worthwhile to start a small preserving business. Chapter 8 explains what this would involve. More information can be found through the

addresses and literature listed in Chapter 9 and in the appendixes that follow, which provide specific information on how to prepare and preserve the various types of fruits and vegetables. Various terms that may be new to readers are defined in the glossary at the end of the booklet.

Agromisa welcomes all readers' comments that could contribute to improving the quality of our publications. A survey form is therefore included in the middle of this booklet, which can be completed and returned to us. Readers seeking more information on food preservation are also encouraged to contact Agromisa's Question and Answer Service at the address listed in the back of this booklet.