Dried Fruits
Phytochemicals and Health Effects

Edited by

Cesarettin Alasalvar
Food Institute, TÜBİTAK Marmara Research Center, Turkey

Fereidoon Shahidi
Department of Biochemistry,
Memorial University of Newfoundland, Canada
Contents

List of Contributors xii
Preface xvii

1 Composition, phytochemicals, and beneficial health effects of dried fruits: an overview 1
   Cesarettin Alasalvar and Fereidoon Shahidi
   1.1 Introduction 1
   1.2 Compositional and nutritional characteristics of dried fruits 2
   1.3 Phytochemicals in dried fruits 6
   1.4 Beneficial health effects of dried fruits 13
   1.5 Commercial products and industrial applications of dried fruits 14
   1.6 Conclusions 14
   References 15

2 Cancer chemopreventive effects of selected dried fruits 19
   Joydeb Kumar Kundu and Young-Joon Surh
   2.1 Chemoprevention: an overview 19
   2.2 The promise of dried fruits in cancer prevention 19
   2.3 Dried fruits as a potential source of chemopreventive phytochemicals 21
   2.4 Biochemical basis of chemoprevention with dried fruits 21
   2.5 Chemopreventive properties of bioactive substances derived from selected dried fruits 24
   2.6 Conclusions 39
   Acknowledgments 40
   References 40

PART 1 DRIED BERRIES

3 Phytochemicals and health benefits of blackberries and black currants 55
   Haiming Shi and Liangli (Lucy) Yu
   3.1 Introduction 55
   3.2 Compositional and nutritional characteristics of blackberries and black currants 55
   3.3 Phytochemicals in blackberries and black currants 58
   3.4 Health benefits of blackberries and black currants 66
## Contents

3.5 Commercial products and industrial applications of blackberries and black currants 68
3.6 Drying effects on antioxidant capacities and phenolics of blackberries and black currants 69
3.7 Conclusions 70
References 70

4 **Dried blueberries: the effects of processing on health-promoting compounds** 75
  *William L. Kerr*

4.1 Introduction 75
4.2 Varieties and composition 76
4.3 Compositional and nutritional characteristics of blueberries 77
4.4 Phytochemicals 79
4.5 Health effects related to blueberries 83
4.6 Effects of processing on blueberry components 88
4.7 Conclusions 94
References 94

5 **Functional characteristics of dried cranberries** 101
  *K.M. Schaich*

5.1 Introduction 101
5.2 Composition and nutritional characteristics of dried cranberry powder 102
5.3 Natural antioxidants in dried cranberry powder 113
5.4 Health effects of dried cranberry powders 116
5.5 Food applications of dried cranberry powders 123
5.6 Conclusions 126
References 126

6 **Phytochemicals and health benefits of goji berries** 133
  *Ying Zhong, Fereidoon Shahidi, and Marian Naczk*

6.1 Introduction 133
6.2 Functional components in goji berries 134
6.3 Health benefits of goji berries 139
6.4 Conclusions 141
References 141

7 **Dried mulberries: phytochemicals and health effects** 145
  *Mine Gultekin Ozguven and Beraat Ozcelik*

7.1 Introduction 145
7.2 Drying of mulberries 146
7.3 Compositional and nutritional characteristics of mulberries 146
7.4 Phytochemicals in mulberries and their by-products 148
7.5 Natural antioxidants in mulberries 151
7.6 Health effects of mulberries 153
8 Dried raspberries: phytochemicals and health effects

Esteban I. Mejia-Meza, Jaime A. Yáñez, Neal M. Davies, and Carter D. Clary

8.1 Introduction 161
8.2 Dehydration of raspberries 161
8.3 Phytochemicals in dried raspberries 162
8.4 Antioxidants in dried raspberries 169
8.5 Health benefits of dried raspberries 171
8.6 Conclusions 172
References 172

9 Phytochemical antioxidants and health benefits of dried strawberries

Rong Tsao and Hongyan Li

9.1 Introduction 175
9.2 Phytochemicals 176
9.3 Factors affecting phytochemicals 180
9.4 Health benefits of strawberries 182
9.5 Conclusions 186
References 186

10 Beneficial effects of dried berry fruits in human health and disease prevention

Shirley Zafra-Stone, Manashi Bagchi, and Debasis Bagchi

10.1 Introduction 192
10.2 Antioxidant protection 193
10.3 Cardiovascular health and metabolic syndrome 193
10.4 Neuroprotection 196
10.5 Anticancer activity 197
10.6 Helicobacter pylori and inflammatory response 203
10.7 Diabetes and vision 204
10.8 Conclusions 205
References 205

PART 2 NONTROPICAL DRIED FRUITS

11 Phytochemicals and health benefits of dried apple snacks

H.P. Vasantha Rupasinghe and Ajit P.K. Joshi

11.1 Introduction 213
11.2 Food applications of dried apple snacks 213
11.3 Effects of drying methods and vacuum impregnation (VI) on apple phytochemicals 214
11.4 Antioxidant capacity of dried apple snacks 217
11.5 Compositional and nutritional characteristics of dried apple snacks 220
11.6 Health benefits of fresh and dried apples 222
11.7 Conclusions 222
References 223

12 Phytochemicals and health benefits of dried apricots 226
Neslihan Göncüoğlu, Burçe Ataç Mogol, and Vural Gökmen
12.1 Introduction 226
12.2 Production 226
12.3 Compositional and nutritional characteristics of dried apricots 228
12.4 Phytochemicals in dried apricots 229
12.5 Antioxidant activity of dried apricots 232
12.6 Chemical changes during drying of apricots 233
12.7 Effects of sulfur treatment on phytochemical content of apricots 234
12.8 Health benefits of dried apricots 236
12.9 Conclusions 239
References 239

13 Dried cherries: phytochemicals and health perspectives 243
Letitia McCune
13.1 Introduction 243
13.2 Production 243
13.3 Methods of drying 244
13.4 Nutritional characteristics 245
13.5 Antioxidant phytochemicals 246
13.6 Health benefits 248
13.7 Conclusions 253
References 253

14 Dried citrus fruits: phytochemicals and health beneficial effects 258
Tzou-Chi Huang and Chi-Tang Ho
14.1 Introduction 258
14.2 Compositional and nutritional characteristics of citrus 259
14.3 Phytochemicals in citrus 259
14.4 Health effects of dried citrus peels 267
14.5 Food application of citrus and their by-products 274
14.6 Conclusions 276
References 276

15 Functional characteristics of dried figs 284
Cesarettin Alasalvar
15.1 Introduction 284
15.2 Compositional and nutritional characteristics of fresh and dried figs 284
15.3 Phytochemicals in dried figs 288
15.4 Health benefits of dried figs 296
15.5 Conclusions 296
References 297

16 Drying nectarines: functional compounds and antioxidant potential 300
Daniel Valero, Huertas María Díaz-Mula, and María Serrano
16.1 Introduction 300
16.2 How to dry nectarines 301
16.3 Compositional and nutritional characteristics of dried nectarines 301
16.4 Phytochemicals in dried nectarines 303
16.5 Health benefits of dried nectarines 305
16.6 Commercial products and industrial applications of dried nectarines 306
16.7 Conclusions 306
References 306

17 Phytochemical composition and health aspects of peach products 309
Emilio Alvarez-Parrilla, Laura A. de la Rosa, Gustavo A. González-Aguilar, and Jesús F. Ayala-Zavala
17.1 Introduction 309
17.2 Compositional and nutritional changes of peaches during dehydration 310
17.3 Phytochemicals in fresh and processed peaches 312
17.4 Health effects of peaches 318
17.5 Dry peaches and their by-products 320
17.6 Conclusions 321
Acknowledgments 321
References 321

18 Dried pears: phytochemicals and potential health effects 325
Lisete Silva, Fereidoon Shahidi, and Manuel A. Coimbra
18.1 Introduction 325
18.2 Phytochemicals in pears 326
18.3 Changes in phytochemical compounds during drying of pears 333
18.4 Bioavailability and potential health effects 338
18.5 Conclusions 346
References 347

19 Prunes: are they functional foods? 357
Alessandra Del Caro and Antonio Piga
19.1 Introduction 357
19.2 Compositional and nutritional characteristics of prunes 358
19.3 Phytochemicals in prunes and their by-products 360
19.4 Natural antioxidant in prunes 362
19.5 Health effects of prunes 363
19.6 Food application of prunes and their by-products 365
19.7 Conclusions 366
References 366
20 Raisins: processing, phytochemicals, and health benefits 372
Fereidoon Shahidi and Zhuliang Tan

20.1 Introduction 372
20.2 Types of raisins 372
20.3 Processing of raisins 373
20.4 Composition of raisins 376
20.5 Phytochemicals in raisins 377
20.6 Bioactivities and health benefits of raisins 384
20.7 Conclusions 387
References 388

PART 3 TROPICAL DRIED FRUITS

21 Açai fruits: potent antioxidant and anti-inflammatory superfruits with potential health benefits 395
Alexander G. Schauss

21.1 Introduction 395
21.2 Compositional and nutrition characteristics of açai fruits 396
21.3 Antioxidant and anti-inflammatory activities of açai fruits 398
21.4 Phytochemicals in açai fruits 402
21.5 Processing of açai fruits for value-added products 406
21.6 Conclusions 408
References 409

22 Bananas, dried bananas, and banana chips: nutritional characteristics, phytochemicals, and health effects 414
Arianna Carughi

22.1 Introduction 414
22.2 Production and consumption 414
22.3 Dried bananas or banana figs 415
22.4 Dried and fried banana chips (crisps) 416
22.5 Nutritional content of bananas, dried bananas, and banana chips 416
22.6 Phytochemicals in bananas and dried fruit products 421
22.7 Potential health benefits of dried bananas 423
22.8 Conclusions 424
References 424

23 Nutritional composition, phytochemicals, and health benefits of dates 428
Cesarettin Alasalvar and Fereidoon Shahidi

23.1 Introduction 428
23.2 Compositional and nutritional characteristics of fresh and dried dates 429
23.3 Phytochemicals in fresh and dried dates 432
23.4 Health benefits of dates 438
23.5 Food application of dates, syrups, and their byproducts 439
23.6 Conclusions 440
References 440
24 Neutraceutical properties of dried tropical fruits: guavas and papayas

K. Nagendra Prasad, Azrina Azlan, and Barakatun Nisak Mohd Yusof

24.1 Introduction 444
24.2 Guavas 445
24.3 Papayas 449
24.4 Conclusions 453
Acknowledgments 453
References 453

25 Dried mangoes: phytochemicals, antioxidant properties, and health benefits

Fouad Abdulrahman Hassan, Sadeq Hasan Al-Sheraji, and Amin Ismail

25.1 Introduction 457
25.2 Compositional and nutritional characteristics of dried mangoes 458
25.3 Phytochemicals and antioxidant activity of dried mangoes 460
25.4 Health benefits of dried mangoes 465
25.5 Conclusions 466
References 466

26 Phytochemicals and health applications of dried passion and pineapple fruits

Jian Sun, Li Li, Xiangrong You, Changbao Li, Zhichun Li, and Fen Liao

26.1 Introduction 471
26.2 Compositional and nutritional characteristics of dried passion and pineapple fruits 472
26.3 Phytochemicals in dried passion and pineapple fruits 473
26.4 Health benefits of dried passion and pineapple fruits 479
26.5 Commercial products and industrial applications of dried passion and pineapple fruits 482
26.6 Conclusions 482
Acknowledgments 482
References 483

Color plate section located between pages 356 and 357.

Index