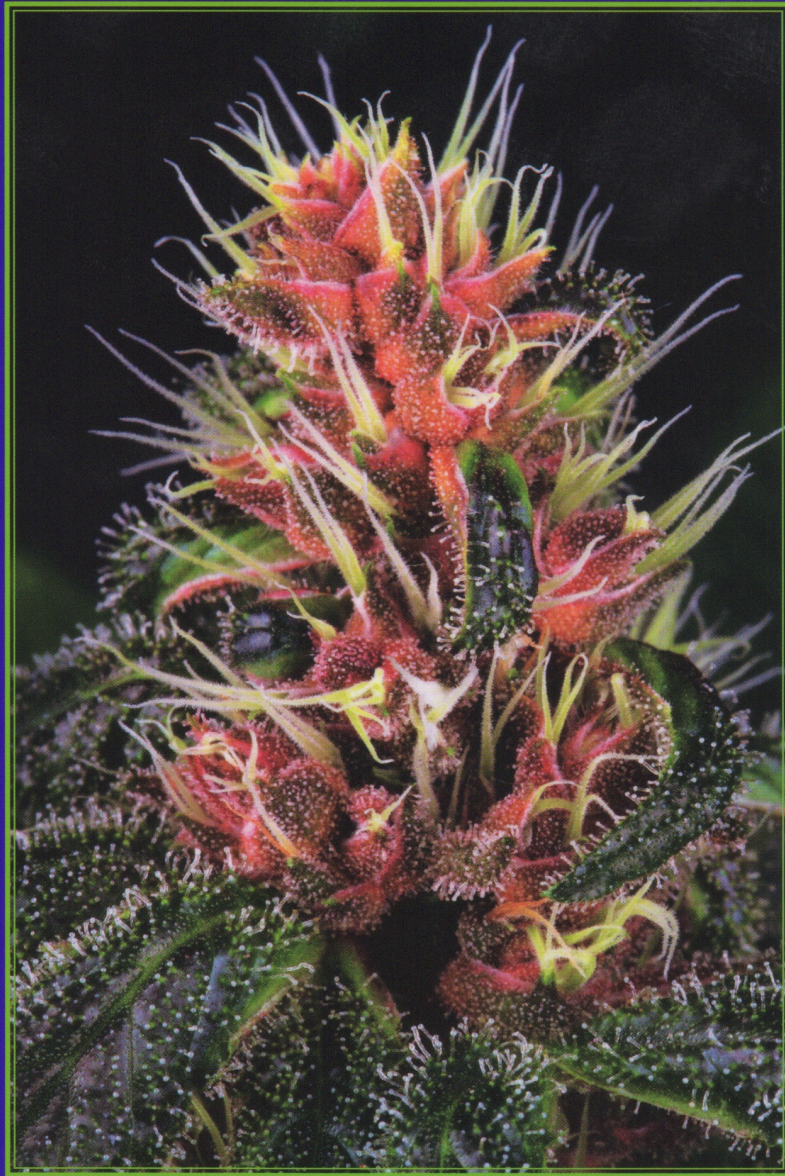


The CANNABIS  
ENCYCLOPEDIA

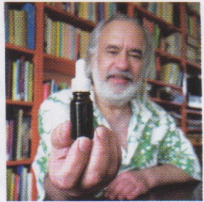


Jorge Cervantes

# CONTENTS

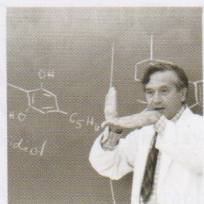
Note: This table of contents has been pared down to represent the book's main categories. Individual chapters start with a detailed table of contents and include page numbers.

## Part 1 | Medical Cannabis



### Chapter 1 – Medical Cannabis – Page 13

Classification; Medical Use before the Modern Era; Cannabis in the Medical Literature; Anecdotal Evidence; The Endocannabinoid System; What the Doctors Have Learned; The CBD Era; P.S. (Post Sanjay)



### Chapter 2 – Measuring Cannabinoids – Page 23

Selecting a Cannabis Laboratory; The Potency Testing Process; Gas Chromatography (GC); High-Performance and Ultra-High-Performance Liquid Chromatography (HPLC and UPLC); Comparing Test Results - HPLC vs. GC; Alternate Methods of Potency Testing: Thin-Layer Chromatography (TLC); How Patients Can Use Potency Results; Cannabinoid Potency Testing as a Tool for the Farmer and Breeder; Cannabis Safety Testing - Pesticides, Microbiological and Other Contaminants; Focus on Safety - *Aspergillus* Contamination, Why It Matters



### Chapter 3 – Medical Cannabis Varieties – Page 33

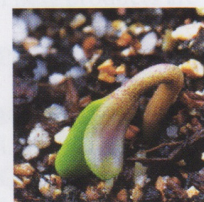
Cannabis Varieties; *Cannabis sativa*; *Cannabis indica*; *Cannabis ruderalis*; Feminized Cannabis; Autoflowering Feminized Cannabis; *Indica/Sativa* Crosses; High-CBD Varieties; High-THC Varieties

## Part 2 | Essential Medical Cannabis Horticulture



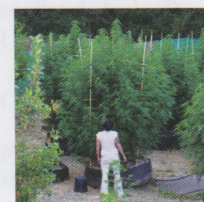
### Chapter 4 – Cannabis Life Cycle – Page 41

Innate Qualities of Cannabis; Life Cycle of Cannabis; Seeds & Seedlings; Vegetative Growth; Flowering; Mother Plants; Three Gardens



### Chapter 5 – Seeds & Seedlings – Page 49

Seeds; Seed Germination; Agricultural Astrology – Planting by the Moon; How to Germinate Seeds: Step-by-Step; How to Plant Seeds: Step-by-Step; Grow More Females from "Regular" Seed; Seedlings; Finding Seeds; Storing Seeds



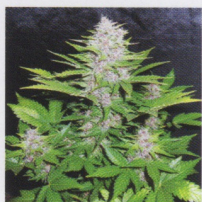
### Chapter 6 – Vegetative Growth – Page 61

Transplanting; Bending and Training; Trellises and Ties; Pruning; Pruning Techniques; Grafting; Stress



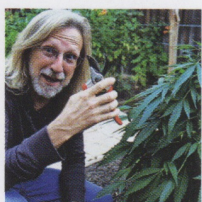
## Chapter 7 – Clones & Cloning – Page 73

Mother Plants; Preparing to Clone; Rooting Hormones; Before Starting; Caring for Clones; Cloning Techniques; Storing Clones



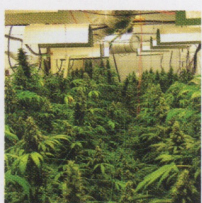
## Chapter 8 – Flowering – Page 85

Trichomes and Resin Glands; *Indica*, *Sativa*, and *Ruderalis*; Stress and Sex; Pre-flowering; Male Pre-flowering; Male Flowering; Female Pre-flowering; Female Flowering; Sinsemilla Flowering; Calyx, False Calyx, and Bracts; Colas and Foxtails; Rejuvenation



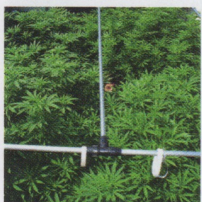
## Chapter 9 – Harvest, Drying & Curing – Page 99

Before Harvest; Leaves; Male Harvest; Sinsemilla Harvest; Qualities of *Indica*, *Sativa*, and *Ruderalis*; Harvest Timing; Harvest: Step-by-Step; Manicuring; Drying; Curing; Packaging and Storage; What to Do with a Moldy Crop



## Chapter 10 – Garden Rooms – Page 123

Carbon Footprint; Closed (Sealed) Rooms; Setting Up the Garden Room: Step-by-Step; Step One: Define Needs and Desires; Step Two: Budget; Step Three: Tools; Step Four: Site Selection; Step Five: Design the Room; Step Six: Electrical Needs; Step Seven: Enclose the Garden Room; Step Eight: Divide into Two Rooms; Step Nine: Increase Light Reflectivity; Step Ten: Install a Vent Fan; Step Eleven: Install an Air Filter; Step Twelve: Install Circulation Fans; Step Thirteen: Install a Hygrometer/Thermometer; Step Fourteen: Install Lights; Step Fifteen: Water Source and Reservoir; Step Sixteen: Install a Hydroponic or Soil Garden; Step Seventeen: Systems Check – Ready to Grow!



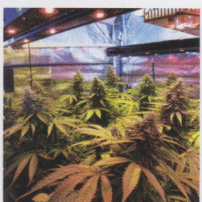
## Chapter 11 – Greenhouses – Page 137

Siting the Greenhouse; Types of Greenhouses; Greenhouse Construction; Coverings; Climate Control; Cooling; Heating; Artificial Lighting; Light Deprivation



## Chapter 12 – Outdoors – Page 151

Climate; Microclimates; Sunlight and Siting the Garden; Water and Irrigation; Pumps; Temperature and Humidity; Wind; Rain; Soil; Fertilizers; Backyard Gardens; Container Gardens; Large Gardens; Remote Gardens; Starting Clones and Seedlings Indoors; Planting Time; Maintenance; Harvest



## Chapter 13 – Case Studies – Page 173

### #1: Indoor Garden – Page 173

Construction; Soil, Water, and Nutrients; Grow-Tent Rooms; Big Rooms; Temperature, Humidity, and Ventilation

### #2: Indoor LED HPS Lights – Page 181

Seeds and Seedlings; Vegetative Growth; HPS and LED Light; Air; Water and Fertilizer; Flowering

### #3: Outdoor Backyard Garden – Page 189

2010 Backyard Garden; 2011 Backyard Garden; 2012 Backyard Garden

### #4: Outdoor Large Garden – Page 195

March; April; May; June; July; August; September; October

## Part 3 | Advanced Medical Cannabis Horticulture



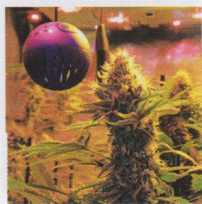
### Chapter 14 – Preserving the Sanctuary – Page 203

Sanctuary Preservation; Sanctuary Surveillance; Sound Security; Light Leaks; Fragrance; Electrical Security; Internet Security; Outdoor Security; Law Enforcement; Informants; High-Tech Surveillance



### Chapter 15 – Meters – Page 215

Air Meters; Electric and Light Meters; Soil, Nutrient Solution, and Water Meters; Miscellaneous Meters



### Chapter 16 – Air – Page 227

Temperature; Humidity; Air Movement; Intake Air; CO<sub>2</sub> Enrichment; CO<sub>2</sub> Emitter Systems; CO<sub>2</sub> Generator Systems; Other Ways to Make CO<sub>2</sub>; Fragrance; Air Filters; Types of Activated Charcoal; Extending the Life of Carbon Filters; Reactivating and Reusing Carbon; The Ventilation System



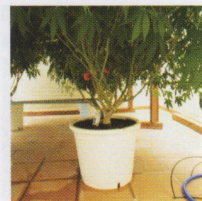
### Chapter 17 – Light, Lamps & Electricity – Page 253

Ultraviolet (UVA, UVB, UVC) Light; Light Intensity; Measuring Light; Photoperiod; Indoor and Greenhouse Garden Lamps; High-Intensity Discharge (HID) Lighting Systems; HID Ballasts; HID Bulbs; Mercury Vapor Lamps; Metal Halide Bulbs and Ballasts; High-Pressure Sodium Bulbs and Ballasts; Conversion Bulbs; Fluorescent Lamps, Ballasts, and Fixtures; Compact Fluorescent Lamps; Plasma Lamps; Light-Emitting Plasma (LEP) Lamps; Magnetic Induction Lamps; Light-Emitting Diode (LED) Lamps; Other Lamps, Getting the Most Artificial Light; Rotating Plants; Plant Spacing; Reflective Hoods; Reflective Light; Light Movers; Electricity and Safety; Electricity Consumption



### Chapter 18 – Soil – Page 303

Soil Tests; Plant Tissue Analysis; Texture and Types of Soil; Soil pH; Soil Temperature; Soil Amendments; Soil Mixes; Potting Soil; Propagation Cubes and Pellets; Used, Indoor Soil Disposal; Grow-Medium Problems; Organic Soil and the Soil Food Web; Salt-Based Fertilizers; Mulch



### Chapter 19 – Containers – Page 327

Types of Containers; Container Shape and Size; Root Pruning; Drainage and Leaching; Container Problems



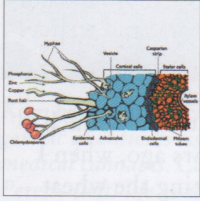
### Chapter 20 – Water – Page 333

Sources of Water; pH; How Fluids Move within Cannabis; Osmosis; Irrigation



## Chapter 21 – Nutrients – Page 349

Nutrients; Macronutrients; Secondary Nutrients; Micronutrients; Fertilizers; Organic Fertilizers; Mixing Fertilizers; Fertilizer Application; Foliar Feeding; Common “Nutrient” Problems; Organic Nutrients List; Compost and Compost Teas; Recipes for Five Gallons of Compost Tea



## Chapter 22 – Additives – Page 395

Hormones; Enzymes; Amino Acids; Colchicine; Humic Acid; Fungi; Bacteria; Miscellaneous Additives; Colloidal Silver; Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>); Propolis; Triacantanol; Vitamins; Growth Retardants



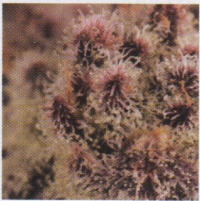
## Chapter 23 – Container Culture & Hydroponics – Page 407

Container Culture and Hydroponics; Aeroponic Gardens; Deep Water Culture (DWC); Nutrient Film Technique (NFT); Hydro-Organic; Ebb-and-Flow Gardens; Top-Feed Gardens; Run-to-Waste Gardens; Wick Gardens; Aquaponics; Hydroponic Nutrients; Nutrient-Solution pH; Nutrient-Solution EC; Dissolved Oxygen; Solution Mixing and Maintenance; Reservoirs; Nutrient-Solution Pumps; Air Pumps; Growing Mediums; Sterilizing Substrates; Irrigation; Microirrigation; Container Culture and Hydroponic Nutrient Disorders



## Chapter 24 – Diseases & Pests – Page 449

Diseases; Bacterial Diseases; Viruses; Storage Fungi and Bacteria; Contaminants; Pest Insects and Mites; Pest Mammals; Other Large Pests; Rogue Pollen; Disease and Pest Controls; Beneficial Insects; Unexplained Problems; Sprays and Spraying



## Chapter 25 – Breeding – Page 507

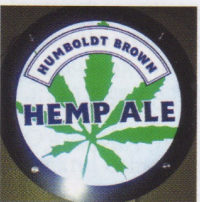
Unforgettable Qualities of Cannabis; Physiology of Male and Female Flowers; Sexual Propagation; Classical Cannabis Breeding; Influence of Alleles; Dominant and Recessive Traits; True Breed; Hybrids; Inbreeding; Outbreeding; Backcrossing; Self-Pollinating (Selfing); Feminized Seeds; Day-Neutral (aka Autoflowering) Feminized Varieties; Making Seeds at Home; Making Seeds: Step-by-Step; Seed-Crop Care; Breeding Terms; Ploidy Factor; Modern Cannabis Breeding

## Part 4 | Post Harvest



## Chapter 26 – Medicinal Concentrates & Tinctures – Page 533

Before Making Hashish; Dry Separation; Water-Extracted Resin; Carbon Dioxide (CO<sub>2</sub>) Extraction; Storing Separated Resin; Concentrated Cannabis Resin; Solvents; Consuming Cannabis Oil; Tinctures; Lotions and Salves



## Chapter 27 – Cooking with Medicinal Cannabis – Page 557

Decarboxylation and Solubilization; Safety – Clean Cannabis; Grades of Cannabis; Temperature and Volatility; Utensils; Cooking with Cannabis; Recipes; Cannabis Beverages

Appendix – Page 575; Contributors – Page 578; Index – Page 581; About Jorge – Page 587

www.marijuanagrowing.com



*Cannabis* growing in the Rif Mountains, Morocco



Conservationist and hemp activist David Bronner, president of Dr. Bronner's Magic Soaps, inspects a field of industrial hemp in Colorado, 2013. See [www.drbronner.com](http://www.drbronner.com) for more information.

### Classification

Swedish botanist Carl Linnaeus formally described *Cannabis sativa* in 1753. Thirty-two years later Jean-Baptiste Lamarck identified *Cannabis indica* as a second species. Experts continue to debate whether they should be classified as separate species or as separate varieties of one species. Extant populations of a possible third species, *Cannabis ruderalis*, may be a wild-type relic that descended from the ancestor of *C. sativa*.

Then came *That '70s Show*, when *Cannabis* taxonomy became embroiled in the US legal system. The ethnobotanist Richard Evans Schultes, a defense witness, asserted that narcotics laws referred to *C. sativa*, whereas the

accused possessed *C. indica*, which was statutorily overlooked and technically legal. Ernest Small, a taxonomic botanist, argued for a single species on behalf of the plaintiffs.

Unfortunately, Schultes and his colleague Loren Anderson made subtle shifts in *Cannabis* taxonomy that departed from the original concepts of Linnaeus and Lamarck. They included drug plants as well as fiber-type plants within *C. sativa*. (We now know that the drug plants are rich in 9-tetrahydrocannabinol or THC, and the fiber-type plants are rich in cannabidiol or CBD.) Linnaeus's *C. sativa* specimens were examined by William Stern in 1974 and found to be "old cultivated hemp stock of northern Europe"—rope, not dope—CBD-dominant plants.

Schultes and Anderson delimited *C. indica* to plants that Schultes saw in Afghanistan. Thus they characterized "indica" as short, densely-branched plants with broad leaflets, and "sativa" along the lines of Lamarck's species—tall, laxly branched, with narrow leaflets. They spawned the vernacular taxonomy of "sativa" and "indica" that is in use to this day. With burgeoning interest in high-CBD plants, some of which are *C. sativa* in the Linnaean sense, the vernacular taxonomy has become truly muddled.

Botanist Karl Hillig segregates these populations: *C. sativa* represents CBD-dominant plants from Europe, either cultivated (*C. sativa* hemp biotype) or wild-type (*C. sativa* feral biotype).

*C. indica* represents THC-dominant plants from Asia, either Lamarck's plants from India—*C. indica* NLD ("narrow leaflet diameter," known as "sativa" in the vernacular) or plants from Afghanistan—*C. indica* WLD ("wild leaflet diameter," the vernacular "indica").

Naturalists Robert Clarke and Mark Merlin adopted Hillig's system and expanded it. Examining the worldwide distribution of *Cannabis* plants—wild, cultivated, and feral (once cultivated, again wild)—these experts conclude that:

Narrow-leaf hemp, *C. sativa*, subspecies *sativa*, was cultivated predominantly in Europe.

Broad-leaf hemp, *C. indica*, subspecies *chinensis*, was cultivated in China, Korea, Japan, and Southeast Asia.

Narrow-leaf drug plants, *C. indica*, subspecies *indica*, were cultivated in South and Southeast Asia and the Middle East.

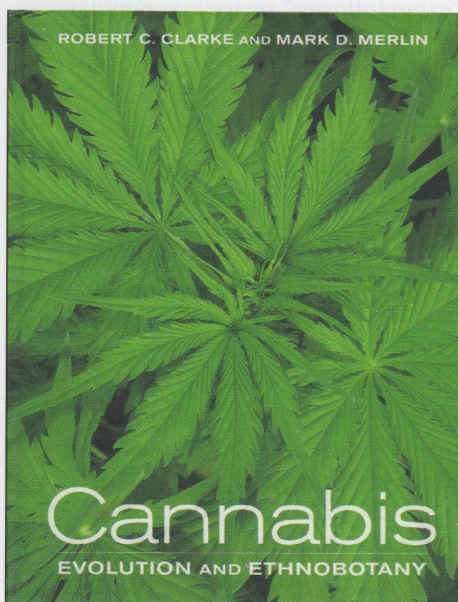
Broad-leaf drug plants, *C. indica*, subspecies *afghanica*, were cultivated in Northern Afghanistan and Pakistan.

Note that the widespread interbreeding and hybridization of narrow- and broad-leafletted plants has made the application of these terms botanically imprecise in many cases.

### Medical Use before the Modern Era

All the famous Old-World cradles of civilization put cannabis to medical use—China, Mesopotamia, Greece, India, and maybe Egypt. The Scythians, a tribe of migrants who inhaled cannabis-infused steam for ritual purposes, migrated out of their Siberian homeland around 800 BC. They lacked a written language, but their word for *Cannabis* has been reconstructed as *kanab*, *kanap*, *konaba*, or *kannabis*. The Scythians influenced civilizations in China, India, and Mesopotamia at the cusp of history.

Physician and historian Ethan Russo has visited a tomb in the Yánghai burial ground that contained nearly a kilo of cannabis. It was crudely manicured—flowering tops, leaves, and seeds, and no stems. The grave did not contain hemp



Robert Clarke and Mark Merlin's book *Cannabis Evolution and Ethnobotany*