


[**Spices of the World**]

An Overview

[**Spices Drove Exploration**]

- **Major voyages of exploration in search of spices**
- **Pepper and Clove**
 - High demand in Europe
 - Very valuable commodity
 - Find and control source



[**Spices Important in World Trade**
75% of World Trade]

- **Pepper**
- **Capsicums**
- **Cinnamon**
- **Ginger**
- **Turmeric**

Percent of World Trade for Important Spices

Pepper	33%
Capsicum	22%
Seed spices	15%
Tree spices	14%
Turmeric	8%
Ginger	6%
Cardamon	4%
Vanilla	2%

Weiss. 2002. Spice Crops. CABI Publishing

Tropical Spices imported in the USA

Spice	USA imports	Producing countries
Cardamon	3,200	Guatemala, India
Chilli	54,000	India, Morocco, Sri Lanka, Tanzania
Cinnamon	19,500	Madagascar, Indonesia, Sri Lanka, Seychelles
Clove	1,200	Indonesia, Madagascar, Sri Lanka, Tanzania
Cumin	7,200	India
Ginger	14,000	India (91,000 to Japan)

Tropical Spices imported (tonnes) in the USA

(Weiss, 2002)

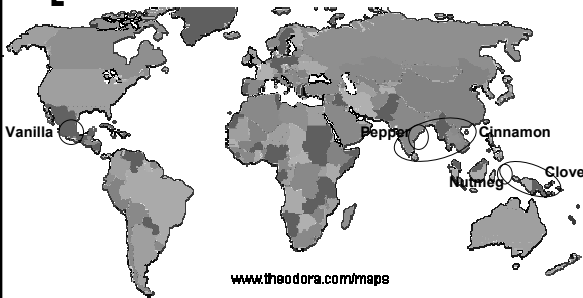
Spice	USA imports	Producing countries
Mace	200	Indonesia, Grenada, Sri Lanka, India, Malaysia
Nutmeg	1,500	Indonesia, Grenada, Sri Lanka, India, Malaysia
Pepper	42,500	Brazil, India, Indonesia, Madagascar, Malaysia, Sri Lanka
Tumeric	2,300	India
Vanilla	1,900	Madagascar

FAO Production Statistics

(FAOSTAT, 2000-2004)

	1,000s MT	% of World Production			
	World	Africa	Asia	Latin America	Oceania
Clove	118	26%	74%	<1%	<1%
Cinnamon	121	1%	98%	<1%	<1%
Pepper	344	3%	79%	17%	<1%
Nutmeg	74	1%	70%	28%	<1%
Vanilla	6.5	45%	49%	3%	3%

Origin of Spices



Spice	Origin	Habitat
Clove	Moluccas (Indonesia)	Evergreen tree, tropical maritime climate
Cinnamon	Sri Lanka, India, SE Asia	Tree of the wet tropics
Pepper	Hills of western India	Tropical woody vines, wet tropics
Nutmeg	Papua New Guinea Moluccas (Indonesia)	Evergreen trees, tropical lowland, dioecious
Vanilla	Mexico	Fleshy herbaecous vine, hot, moist climate

[Clove - *Syzygium aromaticum*]

- **Evergreen tree**
 - Up to 15 m
 - Glossy green leaves
 - Fragrant red flowers
 - Purple fruit
- **Harvest**
 - **Inflorescence**
 - Buds at full size but before they open
 - **Leaves**
 - Leaf oil

[Clove Branch]



[Clove Branch and Flower]



Adaptation Lower montane forests

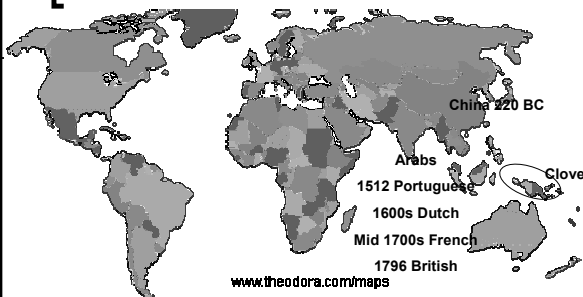
- Partial shade
- Below 300 m

- Precipitation: 2,000 to 3,600 mm
 - Dry season needed for best production
 - Flower bud initiation
 - High humidity at flowering reduce yields
 - 3 month dry season (60-80 mm) for better quality

Early Trade and Use

- Chinese, 200-206 BC
 - From Philippines
- India, 2nd century AD
- Egypt, 1st century AD
 - Regular imports by 2nd century
 - 4th century, traded around the Mediterranean
- 13th century
 - Major source for Europe was Venice
 - Via Alexandria supplied by Arab sailors

Origin of Clove

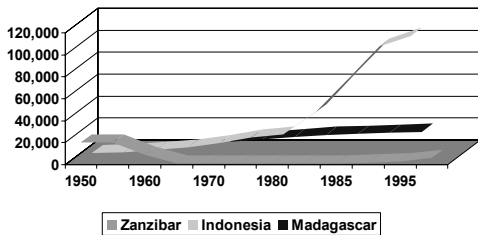


Trade

- Arabs – traded with Europe
- Portuguese – 1512 found Moluccas
- Dutch – early 1600s
- French –
 - Mauritius, Ile de France, Reunion Island, Seychelles
 - Introduced to Zanzibar in 1818
- British
 - Occupation of Moluccas (1796-1802)
 - Penang and other British colonies

Recent Production History of Clove

Clove Production 1950 to 1997
(Weiss, 2002, p 12)



Propagation

- Traditional from seed
 - Seed orchards from selected trees
 - Nursery production – 12 months
 - Transplant to field
 - 1-2 seedling per space
 - 8-9 m for clove production
 - 1 m in row to create hedge for leaf harvest
- New plantations need
 - Windbreaks
 - Shade

Harvest

- **Production**
 - Begins to bear 4-5 years
 - Full production at 20 years
 - Bear for 100 years
- **Varies tremendously from year to year**
 - Average 4-5 kg/tree (0-50 kg/tree)
 - Climatic conditions
 - Shoot and flower initiation
 - Fruit set

Harvest



- **Clove clusters**
 - Buds full size
 - Calyx base pink flush
 - Do not ripen uniformly
 - 5-8 hand harvests per tree
 - 25-55 kg of wet cloves per day



Commercial leaf oil production

- **Hedge row planting**
 - Only in Madagascar
 - Yield 2-3 mt leaves/ha
 - Picked every 2-3 weeks
- **Harvest from clove orchards**
 - Cut foliage off and strip off leaves
 - Top to encourage branching
 - Lower clove yields
 - Collect fallen leaves every 2-3 weeks

[Processing]

- **Cloves**
 - Buds separated from peduncles and pedicels
 - Dried
- **Leaves**
 - Oil extracted via steam distillation

[Uses]

- **Cloves**
 - **Domestic cooking – whole cloves**
 - Pies, stews, soups, ham, pork
 - **Industrial food processing – powder**
 - Baked goods, processed meats, pickles
 - **Cigarettes**
 - Indonesian Kretek cigarettes up to 8%



Uses – Oil

[Main component is Eugenol]

- **Sources**
 - Bud, stem, leaf
 - Bud is highest quality
- **Uses**
 - Seasonings and processed food (bud only)
 - Perfumery
 - Some in pharmaceutical and dental products
- **Antimicrobial, antioxidant, and insecticidal activity**

[**Pepper**]

Piperaceae

**Piper
nigrum**



[**Pepper**
Perennial glabrous woody climber]

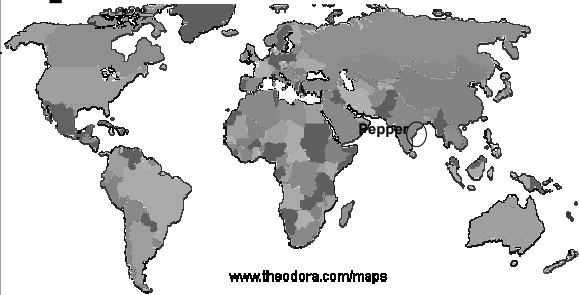


[**Piperaceae**]

- ***Piper* species**
 - ***nigrum*, Black/white pepper**
 - Most important
 - ***cubeba*, Cubeb pepper**
 - ***longum*, Long pepper**

- ***Peperomia* and 10 other genera**

Origin of Pepper



Native to Wet Tropical Forests

- Commercial Production
 - 20° of the equator
- Temperature
 - 25-35 C
 - Minimum 15-18 C
- Rain, well distributed and humid
 - 2,000 to 3,000
 - If dry season, while berries maturing
- Cloudy, partial but not heavy shade
- Soil, well drained and slightly acid to neutral

Propagation

- Stem cuttings, 4-5 months in the nursery



[Planting and pruning]

- **Planted with a support (3m x 3m)**
 - Living or dead, 4-9 m in height
 - Tie 3 climbing vines to support
- **Pruning**
 - Repeated head back to cause branching
 - Every 10 nodes prune back
 - 7-8 prunings to top of support
 - Maximize # of fruiting branches

[Harvest]

- **First harvest**
 - 18-20 months after planting
 - Flower to harvest, 4-10 months
- **Harvest over 3-4 months**
 - White pepper, 1-3 berries ripe
 - Black pepper, berries still green
 - Harvest every 2-3 weeks

[Yields]

- **Well managed orchard in Sarawak**
 - 1st picking, 8,000 to 9,000 kg/ha
 - 6th – 10th picking, 18,000 kg/ha
- **Small farmers – primary producers**
 - India: 900 - 1,000 kg/ha
 - Sri Lanka: 1,350 - 2,500 kg/ha
 - Brazil: 600 – 4,000 kg/ha

[Processing - Two Products]

- **Black pepper**
 - Mature but green
 - Spikes, hours to begin fermentation
 - Stripped off, dried to 12% moisture
- **White pepper (less pungent, mellow)**
 - Ripe and red
 - Berries stripped, in bags in running water
 - Softened pericarp is removed, washed
 - Buff colored berries dried

[Any Questions?]