

# Commercial Production of Ginger and Turmeric

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## Key topics

- Market
- Seed material
- Growing conditions and season extension
- Plant health issues
- Harvest and post-harvest



## Ginger and turmeric are crops with potential to be grown in Florida



Optimal temperature 75 to 90°F, tolerant of high humidity

## Zingiberaceae



The genus *Zingiber* contains 150 species: 34 species from China and 24 species from India.

The genus *Curcuma* contains 110 species. Greatest diversity: India, Malaysia, and Thailand.

## Ornamental *Zingiber* – not edible



*Zingiber zerumbet*



*Zingiber spectabile*



*Zingiber mioga*

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## Ornamental *Curcuma* – Not edible

More than 10 ornamental species (Ravindran et al., 2007).



*Curcuma elata*



*Curcuma roscoeana*

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## Main edible crops

Ginger: *Zingiber officinale*



Turmeric: *Curcuma longa*



Galangal: *Alpinia galanga*



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Some of the Turmeric genetic lines tested in UF trials



Hawaiian BKK



AgriStarts Yellow



Hawaiian White Mango  
(*Curcuma amada*)



Hawaiian Black medicinal  
(*Curcuma caesia*)



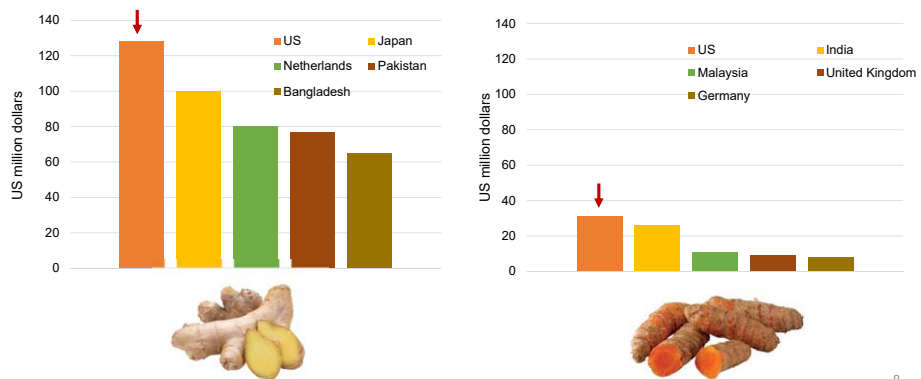
Hawaiian Red



AgriStarts White

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## The US is the biggest importer of these crops in the world



## Value-Added Market: Do not try to compete with cheap bulk imports at \$2-\$3/lb

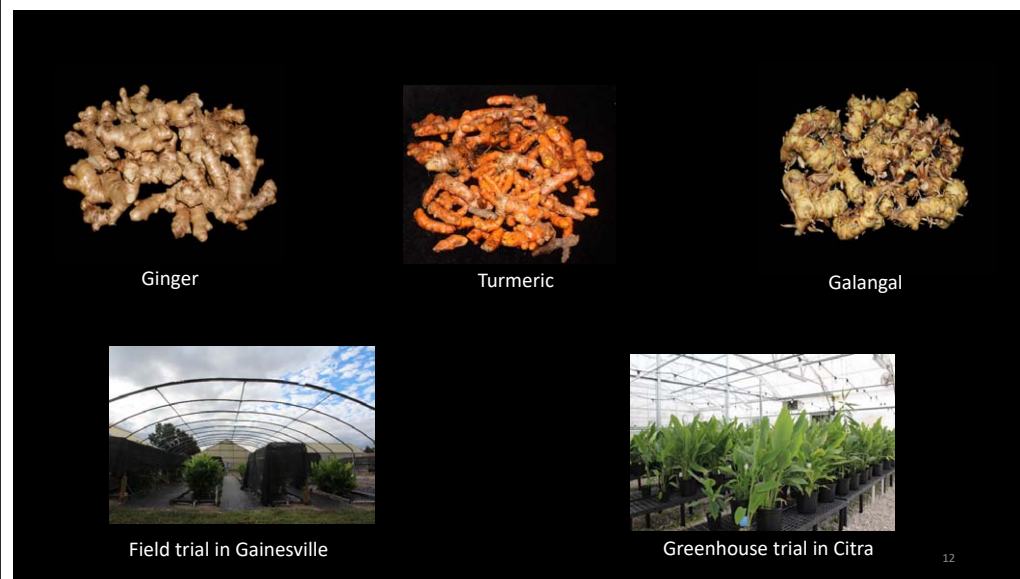


Imported rhizomes purchased at local stores



Fresh rhizomes from Florida

## Baby ginger



Ginger

Turmeric

Galangal

Field trial in Gainesville

Greenhouse trial in Citra



## Ginger and turmeric can also be sold as live plants



**Turmeric**  
 ★★★★★ (2 reviews)  
 OUR PRICE: **\$13.99**

Zones: 9-11  
 Exposure: Full to Part Sun  
 Mature Size: 5'H x 15"S  
 Bloom: White, Summer  
 Pot Size: 3.25"  
 Availability: SHIPS IN AUGUST

Culinary Medicinal Container Indo

Qty:  **ADD**



**Ginger**  
 ★★★★★ (2 reviews)  
 OUR PRICE: **\$13.99**

Zones: 8-11  
 Exposure: Full to Part Sun  
 Mature Size: 36"H x 15"S  
 Bloom: Yellow/Pink, Mid Summer - Early Fall  
 Pot Size: 3.25"  
 Availability: SHIPS IN AUGUST

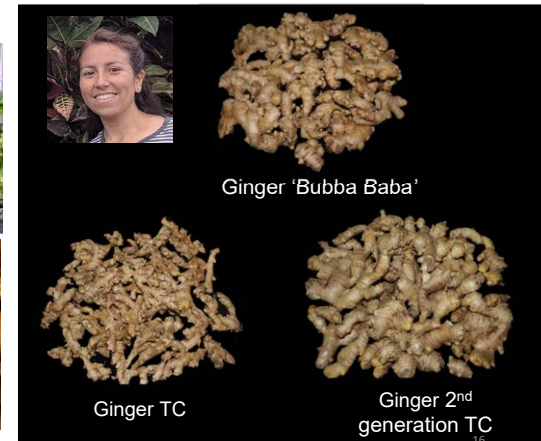
Culinary Medicinal Container Indo Rare

## Seed material

- Rhizome versus tissue culture
- Seed sources
- Seed rhizome planning
- Sprouting
- Keeping your own seed rhizomes

## Tissue culture for potted retail plants, Rhizomes for food yield

Tissue culture (TC) vs. seed rhizomes



## Seed Sources

- Hawaiian Organic Ginger (ginger, turmeric rhizomes): <http://www.hawaiianorganicginger.com/>
- Aloha Turmeric (turmeric rhizomes): <https://www.alohaturmeric.com/>
- AgriStarts (tissue culture): <https://www.agristarts.com/>
- Imported organic produce: (inspect for disease)
- Order early – contact in Nov-Jan. Limited availability and usually Feb to April.



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## Seed rhizome planning

- Around \$7-9 per lb for “seed” rhizomes, around \$3 per lb for organic food rhizomes
- 1-2 oz per seed rhizome (12/lb) ≈ \$0.75 per plant. Several buds per rhizome.
- 1 to 1.5 ft spacing along rows or 2-3 rhizomes per 15 gal pot
- Plant at 2-inch depth below soil



Photo credit: University of Hawaii  
<http://www.ctahr.hawaii.edu/oc/freepubs/pdf/scm-8.pdf>

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## Container production

- 15-gal, 8-inch substrate depth, 3 rhizomes



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## Field production

- Plastic mulch, 1 to 1.5 ft spacing



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- The optimum temperatures for sprouting around 81°F for ginger and turmeric
- The shortest time to sprout were 29 days for ginger and 31 days for turmeric

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Turmeric plants grown from non-sprouted rhizomes



Turmeric plants grown from sprouted rhizomes

Non-sprouted rhizomes lead to un-even growth and delayed development

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## Keeping your own rhizomes for seed

- Check economics and availability of selling versus clean seed cost
- For turmeric, “mothers” (stem base) often kept for seed
- Only firm disease-free plants without discoloration
- Either (a) clean and sanitize surface dip in 50 ppm chlorine or (b) store dry without washing off all soil to minimize damage
- Ideal storage 55 to 60°F moderate humidity



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## Growing conditions and season extension

- Yield and space
- Substrate v soil, container v beds
- Planting
- Shade
- Fertilization
- Delaying dormancy in the fall- day length and temperature

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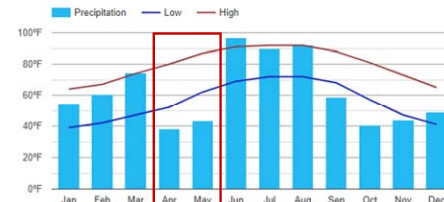
## Yield and space

- 1-2 lb yield per plant
- Hawaiian yield  $\approx$  5 lb per plant
  - Long growing season with year-round moderate temperature (varies less than FL)
  - Close to equator (day length varies less than FL)
- So the key to increasing yield in Florida is season extension and protect from extremes...

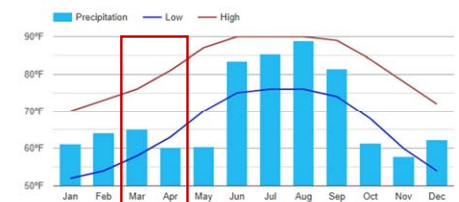


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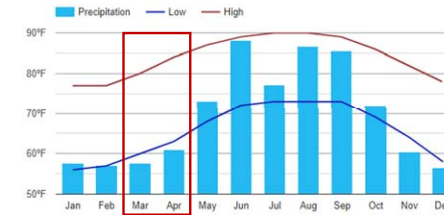
## When should we plant?



Tallahassee, FL



Tampa, FL



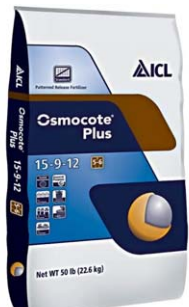
Homestead, FL

Minimum temperature: 68 °F

- Should NOT be exposed to temperatures under 50 °F

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Proper fertilization is very important for growing a good crop of ginger and turmeric



Osmocote  
15-9-12



Peters Excel  
15-5-15

Use fertilizers with lower levels of phosphorus than nitrogen and potassium

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### GREENHOUSE & NURSERY TOPDRESS RATES PER CONTAINER (GRAMS)\*\*

SURFACE APPLICATION RATES PER CONTAINER (GRAMS)				
Common Container Sizes (Volume)	Approx. No. of Containers per Cubic Yard***	Low	Medium	High
6 inch Azalea/ HB (1.5 qt)	539	5	8	12
6 inch Standard (1.75 qt)	462	5	10	14
6.5 inch Azalea (1.8 qt)	449	6	10	15
8 inch Azalea/ HB (3 qt)	269	9	17	24
8 inch Mum Pan (1 gal)	260	10	17	25
9 inch Mum Pan (1.25 gal)	166	15	27	40
10 inch Hanging Basket (1.5 gal)	150	17	30	44
12 inch Color Bowl (2 gal)	112	22	41	59
12 inch Hanging Basket (2.25 gal)	100	25	45	66
1 Quart	850	3	5	8
2 quart	400	6	11	16
Trade 1 Gallon	300	8	15	22
1 Gallon	210	12	22	31
Trade 2 Gallon	125	20	36	53
2 Gallon	102	24	45	65
3 Gallon	70	36	65	94
5 Gallon	52	48	87	127
7 gallon	35	71	130	188
Larger Containers	Surface Area in sq. ft.	Low	Medium	High
10 Gallon - 17" diam	1.4	86	157	228
15 Gallon - 17.5"	1.5	92	168	244
20 Gallon - 21"	2.3	142	258	374
25 Gallon - 22.5"	2.8	173	314	455
30 Gallon - 26.5" diam.	3.8	234	426	618
45 Gallon - 30" diam.	4.8	296	538	780
65 Gallon - 30" diam.	4.8	296	538	780
100 Gallon - 36" diam.	7.1	438	796	1154
200 Gallon - 48.5" diam	12.8	789	1435	2081
24 inch box	4.0	247	448	650
30 inch box	6.25	385	701	1016
36 inch box	9.0	555	1009	1463
48 inch box	16.0	986	1794	2601



Osmocote  
15-9-12

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Ginger plants grown under full sun



Turmeric plants grown under full sun

Pictures taken 5 months after planting



Ginger and turmeric plants grown under 40% shade

## Some type of shade required



20-40% shade



Natural shade

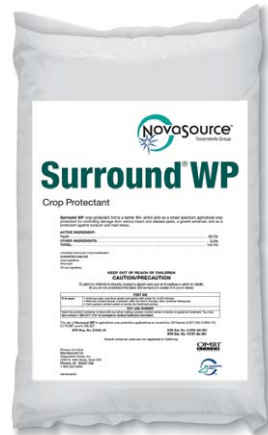


Interplanting

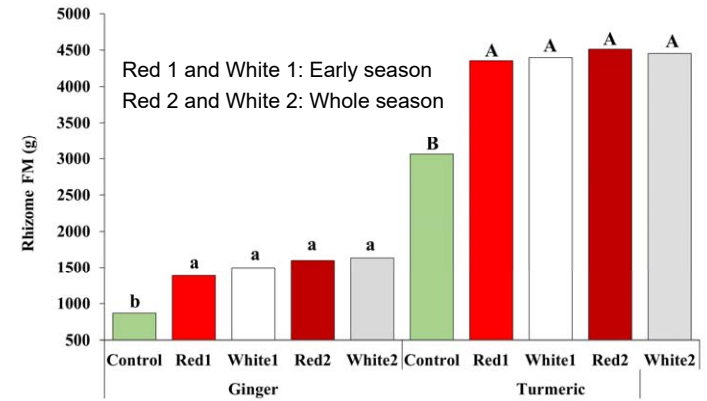
- However, avoid over-shading: excess top growth and less energy for rhizomes



Kaolin sprays biweekly option to minimize radiation stress in field crops during establishment



## Rhizome yield





Ginger and turmeric are long-day plants  
Start going dormant when less than 11 hours sunlight

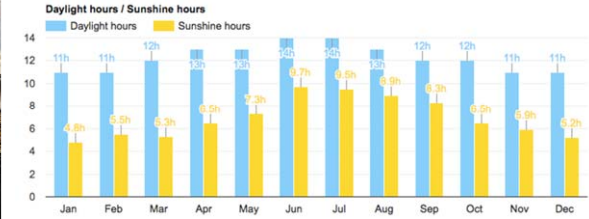


Plant die-back caused by natural short days (SD) in the fall

Ginger and turmeric are long-day plants  
Start going dormant when less than 11 hours sunlight



Plant die-back caused by natural short days (SD) in the fall



Naples, FL  
More variation the further north we go!



- Use electric lights to extend day length August onwards
- **Night interruption** 4 h during the night (10 pm to 2 am)



Plants grown under long days remained dark green and actively growing for longer



- Use electric lights to extend day length August onwards
- **Night interruption** 4 h during the night (10 pm to 2 am)



- A string of construction LEDs is sufficient



## Plant health issues

- #1 Soilborne diseases
- #2 High light and drought stress
- #3 Drought stress
- #4 Fungus gnats during sprouting and initial growth

## Overwatering can lead to diseases



*Fusarium* rot



Bacterial wilt

## How can we prevent diseases?

- Introduced through planting material, soil, equipment, or irrigation.
  - Clean planting material, sanitation, and scouting.
- Maintain required conditions for optimal plant growth and development.
- Provide plants with good drainage and water management.
- In-ground rotation (at least 3 y)





Leaf scorching caused by excess radiation

Plants typically need watering each day but in well-drained soil or substrate



- Irrigation little need during rainy summer if not under cover
- Daily irrigation during spring and fall
- Irrigation stopped when plants are going dormant (helps cleaning of rhizomes)



Minor pest issues such as caterpillars, grasshoppers

Rice Hulls for fungus gnat control in greenhouse

More pest issues when grown in a greenhouse

• Spider mites



• Fungus gnats



Photo credit: D.Cappaert. Bugwood.org

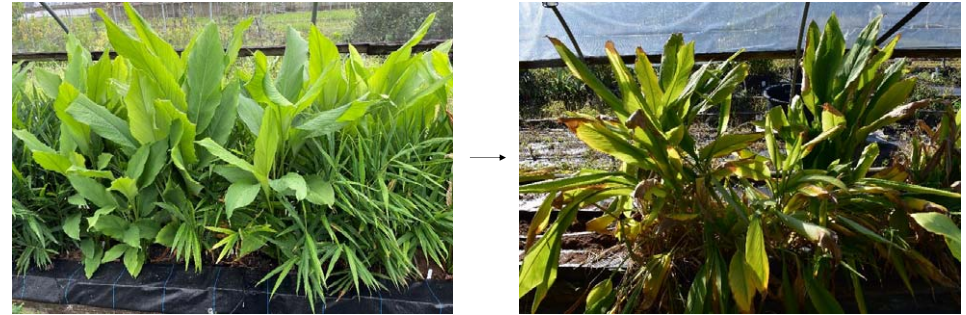
## Harvest and post-harvest

- Cleaning and trimming
- Labor!! v. Automation
- Sanitation & storage



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## When should we harvest?



Harvest at maturity, Nov to Jan  
(8-10 months after receiving rhizomes)

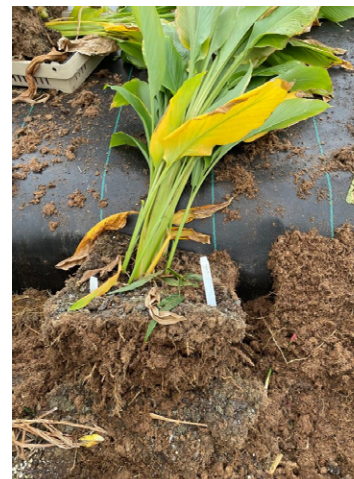
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## Field harvest

- Sweet potato or carrot harvester



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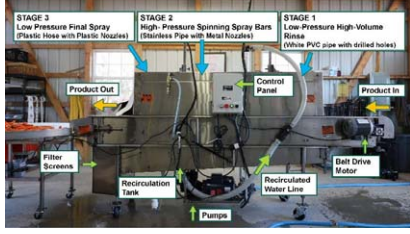


Very labor intensive!



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## Automation



AZS Rinse Conveyor, ≈\$15K



Aloha Turmeric processing

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## Post-harvest

- Clean with water, Trim roots and stems
- Sanitize with 50 ppm chlorine surface treatment (or H<sub>2</sub>O<sub>2</sub>)
- “Baby ginger” will quickly form a cured skin over 3-5 days
- Ideal storage around 55°F and 70% RH



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### Florida trial locations

- Live Oak
- Gainesville
- Apopka
- Seffner
- Homestead



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