Growing Garlic

CURING & STORING GARLIC

LETETIA WARE
Curing and Storing Garlic

- Harvested garlic needs to be CURED before it can be STORED.

- CURING is the process of:
  - completely drying the outer skin wrappers and clove skins
  - maintaining clove oils and moisture
  - developing mature flavour and aroma, losing early green vegetative tones
  - enabling the garlic to store for its optimal dormancy duration

- Cloves from mature bulbs should have a high dry weight and soluble solids content (>35% in both cases)

- CURING is essential to prevent your garlic bulbs from becoming moldy, rotting or reducing storage potential.
Curing pre-cursors

- Curing starts during the last stage of bulb maturation in the ground
- It commences when lower leaves start to die off prior to harvest
- Aided by turning off irrigation 2 weeks prior to harvest

- **REMEMBER**
  - # green leaves = number of complete wrapper skins minus 1
  - If want 4 complete wrapper skins – need to harvest when min 5 green leaves to allow for removal of one outer skin during cleaning
  - If wet soils – may loose additional skin layer

- **TIP**
  - Slightly less mature bulbs have more, tighter bulb skins and store longer
  - Bulbs can double in weight during last two weeks of growth
  - Curing with leaves on/ scape removed can reduce weight loss and increase storage life
Post harvest preparation

- Remove any chunks of dirt from around bulb/root (do not bruise)
- DO NOT wash bulbs or roots (or risk mold and reduce storage life)
- If wet season/harvest – best to remove 1/3 leaves & scapes as well as cutting roots back to basal plate
- Only field dry if weather permits (very dry – low relative humidity)

Most Australian locations are too hot and will scorch/cook the garlic

Other locations are too wet and will encourage mold development
Curing and Storing Garlic

- Once harvested, garlic takes between 3 to 12 weeks to fully cure depending on:
  
  - Temperature
  - Relative humidity
  - Air circulation
  - Amount of green material left on bulb
  - Size
  - Type of bulb
Curing duration by group

<table>
<thead>
<tr>
<th>Group</th>
<th>4-6 weeks</th>
<th>6 – 8 weeks</th>
<th>8-10 weeks</th>
<th>10-12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTNECKS</td>
<td>Silverskin</td>
<td></td>
<td></td>
<td>Artichoke</td>
</tr>
<tr>
<td></td>
<td>80gm</td>
<td></td>
<td>120-240gm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>thin tissue skins</td>
<td></td>
<td>thick, many layered skins</td>
<td></td>
</tr>
<tr>
<td>HARDNECKS</td>
<td>Turban</td>
<td>Creole</td>
<td>Standard Purple Stripe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80gm</td>
<td>80gm</td>
<td>100-200+gm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open cloves (air gaps)</td>
<td>tight cloves (little air gap)</td>
<td>tight cloves (no air gaps)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loose, course skins</td>
<td>tight tissue/course skins</td>
<td>many layered skins develop complex flavour</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80gm</td>
<td>80gm</td>
<td>100-140+gm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tight cloves (little air gap)</td>
<td>tight cloves (little air gap)</td>
<td>tight cloves (little air gap)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tight tissue/course skins</td>
<td>tight tissue/course skins</td>
<td>many layered course skins</td>
<td></td>
</tr>
</tbody>
</table>
Optimal curing conditions

First 3-7 days of curing is vital to remove excess moisture from bulb and retard or arrest mold from saturated/moist bulbs taken from wet soils

- **Temperature** 27°C
  - Vital to first 3-4 days
  - Optimal for balance of curing
  - Retards/arrest mold growth

- **Relative Humidity** <55% at bulb
  - Promotes moisture wicking from bulb & clove skin

- **Air movement** ~1m/s at bulb
  - Removed wicked moisture to prevent mold development

OUT OF DIRECT SUNLIGHT & WEATHER
Four main curing approaches

**LOW INTENSITY**
- INDIVIDUAL PLANTS
- BUNCH HANGING

**HIGH INTENSITY**
- STACKED TRAYS (OPEN)
- STACKED MEGABINS (WRAPPED)

**Curing approaches**

- T = 27°C
- RH = 55%
- Air = 1m/sec

AROUND THE BULB
Measuring Temp & Relative Humidity

LOW INTENSITY CURING

Use multiple reasonably priced meters to hang within hanging areas to monitor conditions and determine if assisted equipment curing is needed:

- Thermometers
- Hygrometers
- Anemometers

TIP: Remember to monitor conditions around the bulbs throughout your curing environment – not just the shed or room space
Measuring Temp & Relative Humidity

HIGH INTENSITY CURING

More sophisticated data logging & telescoping probe meters are needed with high intensity stacking systems to measure & monitor conditions within the stacks

- Thermometers
- Hygrometers
- Anemometers

TIP: Even more important with high density curing to measure frequently and in multiple locations around and within stacks.
Low density – individual systems
Low density – individual systems
Racking systems
Wooden trays – wire base

Stackable racks
Fixed racks with wire bases
Some find rack curing better than bunch curing – better air circulation when vulnerable conditions!

Danielle placing garlic onto our curing racks. We used to hang it in bundles from the tier poles but have found that the garlic will dry faster and better using the curing racks. Our guess is that in our humid climate our garlic needs a little better air flow.
Hanging from roof keeps garlic in hotter region for curing and leaves area functional beneath!
Splitting bunched over timber makes easy hanging.

Note – easy to understand labels!
Low density – hanging systems
Bunches on lines
Low density – hanging systems
Bunches on wooden beams
Incredibly practical hanging system.

- Reo bars spaced up timber supports
- Bunches spread over bars for easy hanging
- Leaf bulk/scapes removed – some green stem leaves remains for nutrient transfer
- Roots removed for faster / safer curing
- Wide alleys for human/ladder access and air circulation
Low density – hanging systems
Elephant garlic in racks
Glass house curing – getting the heat
High top tunnels – heat improved skins
Low Density – assisted curing

- If relative humidity too high around bulbs – need to assist curing to prevent mold/rot

- If open shedding used – limited to using **FANS** and **EXTRACTORS** to assist air movement and remove excess moisture through circulation and evaporation

- Two types of fans:
  - Standard industrial fans (5m impact)
  - High volume, low speed (20-30m impact)

*Inefficient for rapid extraction*
Key to successful passive curing

- Space is key to air circulation – and removal of curing moisture
  - Keep garlic away from walls to allow air circulation (min 1200mm)
  - Keep space between bunches on same line, layers and columns

- To get air to naturally circulate in a large storage area – you need to think of how your arteries, capillaries and veins circulate & return blood
  - Allow large alleys for outside air into deepest section of shedding
  - Larger gaps between layers, smaller gaps between bunches and bulbs
  - Ensure shed allows both entrance and exit of air movement
  - Air does not flow well around dead ends or corners

- Measure & monitor with thermometer, hygrometer and anemometer

- Assist with fans and extractors to move air and remove moisture

- Should be able to feel passive air movement where ever you stand in your curing space

- If humid climate – ensure to remove excess green material & roots
TIP ... to remember

- Your garlic will lose 25-35% of its weight in moisture during curing
- 1 Tonne of garlic will lose 250 litres in moisture over 4-6 weeks
- Need warm air to evaporate moisture from bulb
- Need good air circulation to remove this evaporated moisture
High intensity – stacked trays
Fans, heaters & dehumidifiers
Insulation & extractors
Monitor temp, RH & air movement at junction of 4 trays (should feel air movement when stick arm in)
Don’t over stack trays – must leave air gaps above garlic for air movement
(should feel air movement when stick arm in)
Probably a little over stacked
Large high volume, low speed ceiling fans create pressure waves of air.
Heater & dehumidifier connected to heating oven
108L/day Suntec LGR- SD1001
"Lower Humidity
Performance"
Commercial dehumidifier
$3000

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Suntec 108L LGR Commercial dehumidifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Suntec LGR1001</td>
</tr>
<tr>
<td>Area handling $m^3$</td>
<td>50-1100$m^3$</td>
</tr>
<tr>
<td>Water Removal Max (32C/90%RH)</td>
<td>108 Litres/Day</td>
</tr>
<tr>
<td>(27C/60%RH)</td>
<td>61 Litres/Day</td>
</tr>
<tr>
<td>(10C/70%RH)</td>
<td>27 Litres/Day</td>
</tr>
<tr>
<td>Adjustable Humidity Range</td>
<td>Low 25-80%RH</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>1 - 38 Celsius</td>
</tr>
<tr>
<td>Noise Rating dB</td>
<td>66 dB @ 1 metre</td>
</tr>
<tr>
<td>Defrost Type</td>
<td>Hot - Gas Bypass</td>
</tr>
<tr>
<td>Water pump</td>
<td>Centrifugal</td>
</tr>
<tr>
<td>Rated Air Flow</td>
<td>900$m^3$/hr</td>
</tr>
<tr>
<td>Air Filter</td>
<td>Quality HAF (High Airflow Filter)</td>
</tr>
<tr>
<td>Refrigerant (CFC Free)</td>
<td>410A</td>
</tr>
<tr>
<td>Compressor Type</td>
<td>Rotary</td>
</tr>
<tr>
<td>Housing</td>
<td>Polyethylene</td>
</tr>
<tr>
<td>Wheels</td>
<td>Semi Pneumatic</td>
</tr>
<tr>
<td>Make</td>
<td>Suntec</td>
</tr>
<tr>
<td>Warranty (Manufacturing)</td>
<td>12 months Parts, 2yr Compressor &amp; Coils, 3yr Body</td>
</tr>
</tbody>
</table>

**Power**

| Power Supply                           | 230V Single Phase Power  **Note: 15Amp Plug** |
| Power Consumption                      | 1650W (7.5A)                          |
| Running Costs/10hrs Avg.               | $4.85                                  |
| Control Panel                          | Simple Operation Touch-Pad            |
| Auto Restart                           | Yes                                    |

**Size and Weight**

| Size L x W x H cm                       | 55 x45 x 92                          |
| Weight                                 | 52kg                                   |
| Power Cable Length                     | Included - 8m cable with plug         |
| Drain Hose Length                      | Included 10 m hose                    |
120L/day Airrex dehumidifier

<table>
<thead>
<tr>
<th>Specifications</th>
<th>120L Airex Commercial dehumidifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>Airex-ADH1000</td>
</tr>
<tr>
<td>Area handling $M^3$</td>
<td>50-1000m$^3$</td>
</tr>
<tr>
<td>Water Removal Max (27degC 70%RH)</td>
<td>120 Litres/Day</td>
</tr>
<tr>
<td>(27degC 60%RH)</td>
<td>80 Litres/Day</td>
</tr>
<tr>
<td>Adjustable Humidity Range</td>
<td>30-90% RH</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>5 - 35 Celsius</td>
</tr>
<tr>
<td>Noise Rating dB</td>
<td>Hi Speed 65 dB @ 1 metre Low Speed 53dB</td>
</tr>
<tr>
<td>Defrost Type</td>
<td>Hot - Gas Bypass</td>
</tr>
<tr>
<td>Water pump</td>
<td>Centrifugal</td>
</tr>
<tr>
<td>Rated Air Flow</td>
<td>1080m$^3$/hr</td>
</tr>
<tr>
<td>Refrigerant (CFC Free)</td>
<td>410A</td>
</tr>
<tr>
<td>Casters</td>
<td>Swivel on front</td>
</tr>
<tr>
<td>Make</td>
<td>Airexx</td>
</tr>
<tr>
<td>Warranty (Manufacturing)</td>
<td>12 months RTB</td>
</tr>
<tr>
<td>Power</td>
<td>Power Supply</td>
</tr>
<tr>
<td></td>
<td>240V Single Phase Power</td>
</tr>
<tr>
<td></td>
<td>Power Consumption</td>
</tr>
<tr>
<td></td>
<td>1700W (7.7A)</td>
</tr>
<tr>
<td></td>
<td>Running Costs/10hrs Avg. (Qld rates)</td>
</tr>
<tr>
<td></td>
<td>Simple Operation Touch-Pad</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Size and Weight</td>
<td>Size L x W x H mm</td>
</tr>
<tr>
<td></td>
<td>552x506x995</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
</tr>
<tr>
<td></td>
<td>60kg</td>
</tr>
<tr>
<td></td>
<td>Drain Hose Length</td>
</tr>
<tr>
<td></td>
<td>Included 7 m hose</td>
</tr>
</tbody>
</table>
LGR SDM2700 Dehumidifier

FOB Price : Get Latest Price

Power SDM2700 LGR Industrial Dehumidifier

Drying King in our family range, 270L per day!!

The LGR SDM2700 is ideal for larger jobs. It removal of up to 270L per day and can replace multiple smaller units, saving you time and energy.

Specification

- Water Removal Max (32°C/90%RH): 270L per day
- Water Removal AHAM (27°C/60%RH): 150L per day
- Water Removal (10°C/70%RH): 70L per day
- Operating Temp. Range: 1° - 38° C
- Refrigerant (CFC Free): R410A
- Power Consumption 230V: 3450 Watt
- Power 230V: 13 Amps
- Rated Air Flow: 1500 m3/h
- Control Panel: Touch-pad with Humidistat Control
- Defrost Type: Hot-gas bypass
- Protection Class: IP 22
- Noise Level: 60dB(A)
- Air Filter: Filter
- Housing: Galvanized Sheet Steel
- Large Wheels: Semi-pneumatic
- Drain Hose Length: 4m
- Calbe Length: 4m
- L X W X H: 735 X 580 X 1150mm
- Use Weight: 96kg

Specifications are subject to change without notice. Some values are approximate.
Dehumidifiers and Humidifiers

High Capacity DH150/300/600

**Model:** DH150/300/600

**Applications:** Warehousing, storage, museums

**Manufactured in the UK using globally recognised premium components**
Humidity and dewpoint control by heat pump dehumidification in a wide variety of situations:

- Warehousing/equipment stores
- Metals storage
- Spare parts stores
- Electrical sub stations / pumping stations
- Museums
- Furniture stores

**Moisture reduction for:**

- Drying of timber / ceramics / textiles
- Industry/agriculture - many uses
Alternate equipment - heaters

- Direct fired diesel heater
- Gas heater
- Electrical heater
- Kerosene heater

Direct Fired Diesel Heater – Spitfire DP50
- Thermal capacity: 63.9 kW - 220,000 BTU/H - 55,000 Kcal/H
- Air flow: 1600 M³/Hour
- Fuel consumption: 5.95 L/Hour
- Fuel type: Diesel
- Fuel capacity: 41 Litres
- Burner system: Pump
- Power: 380 Watt - 3.6 Amp
- 230 Volt
- Single phase
- 10 AMP plug
- 50 Hertz
- Optional accessories available
- Spare parts available
- Dry Weight: 50kg
- Dimensions: 513 x 1290 x 735 mm
- Proudly Australian made for over 30 years
Key to successful stacked curing

- Space is key to air circulation – and removal of curing moisture
  - Keep garlic away from walls to allow air circulation (min 1200mm)
  - Keep space between alleys of pallets, between pallets & between trays
  - Don’t overstack trays
  - Top & tail leaves and roots to allow air movement between bulbs

- Measure & monitor with thermometer, hygrometer and anemometer
  - Hang meters throughout curing space for easy monitoring
  - Don’t leave doors open
  - Continually check within trays and inside junction to ensure air movement
  - Should be able to feel air movement when hand in middle of trays
High intensity – wrapped megabins

Bins wrapped in plastic are stacked under portable fans located in top plastic lid on top of bins.

Small heaters can be placed beneath first bin to improve temperature if required.

Monitoring done by inserting probes through plastic & taping after.
Nally Megabin - Vented
Dim: 1165x1165x730mm
Volume capacity: 720L
Weight capacity: 500kgs
Cost: $364+GST

Plastics'R'Us Minibin 8060 Vented JCO-8060V
Dim: 745x545x250mm
Volume capacity: 110 litres
Weight capacity: 60 kg
Cost: na

Viscount Plastics NZ MacroBin 16 and 24 Series

Plastics'R'Us BB 450 Vented Pallet Bin JCO-BB
Dim: 1050x1050x315mm
Volume capacity: 350 Litres
Weight capacity: 250 kg
Cost: $234+GST
Key to successful wrapped megabins

- Don’t over stack megabins to ensure good air movement through all
  - Garlic should be free of soil and be topped and tailed for air movement
  - Monitor frequently with probes to ensure conditions are positive

- Benefits
  - More efficient use of space & energy as concentrated curing

- Risks
  - Can’t easily check on internal condition of curing garlic
  - Easy to desiccate (over cure / dry out)
  - Miss poor conditions that lead to mold
Four factors affect the storage of garlic;  
- how well it was grown and cured  
- its group type  
- temperature and  
- humidity

Garlic that was poorly grown and improperly cured will not get any better in storage.

The optimum storage temperature for bulbs for replanting is 10°C, with limits of 5°C and 18°C.

Garlic stores best long term when it is kept between 12°C and 18°C and between 40% and 60% humidity.
Storage

- If the humidity stays below 40% for a couple of weeks or more, garlic has a tendency to dry out faster than it otherwise would.
- If humidity goes higher than 60% for any extended period of time, fungus and molds can set in.
- If the temperature goes below about 12°C for an extended period of time, garlic tends to want to sprout and grow, even if it is not the right time of year (that's why the refrigerator is not a good place to store garlic).
- If temperatures stay much over 21°C for any extended length of time, garlic tends to dry out and deteriorate.