

Cultural Information for: COCO Marigold™ Annual
Common Name: African Marigold
Botanical Name: Tagetes erecta
Seed Count: 7,100-9,000/oz. 250-320/gr.
Optimum Germination Temperature: 72-75°F / 22-24°C
Optimum Growing Temperature: 68-90°F / 20-32°C
Optimum pH: 5.8 – 6.2 (plug), 6.5 – 7.5 (finished in soil)
EC – Plug: 0.4 – 0.8 mmhos/cm (1:2) / 0.9 – 2.0 (SME) / 1.1 - 2.6 (Pour Thru)
EC – Finishing: 0.9 – 1.3 mmhos/cm (1:2) / 2.1 – 3.5 (SME) / 2.7 - 4.6 (Pour Thru)

Plug Culture - 3 weeks (200 / 10 x 20 tray)

Stage 1 (days 1-5) Select a well-drained media with a pH between 6.2 and 6.5 to avoid iron toxicity. Tagetes erecta (African) is sensitive to iron toxicity at a pH below 5.8, characterized by lower yellow leaves with edge browning/burning. Lightly cover the seeds with medium vermiculite and apply 10-100-foot candles/100-1,000 lux to improve germination. Optimum soil temperature is 72-75°F/22-24°C.

Stage 2 (days 6-10) Marigolds germinate quickly. After emergence place the plug trays in a well-ventilated greenhouse with up to 2,500 f.c./27,000 lux. Reduce moisture and maintain a day temperature of 70°F/21°C and a night temperature of 65°F/18°C.

NOTE: Tagetes erecta is an obligate short-day plant. Provide long day conditions (> 14 hours) in the plug stage to prevent pre-mature flower bud initiation.

Stage 3 (days 11-17) Fertilize at 75 ppm N at least once a week to strengthen the seedlings and promote healthy growth. Watering just before wilt is recommended to avoid excessive growth. One should water thoroughly to prevent high salts. Watering early in the morning allows the foliage to dry thoroughly and prevents potential disease problems.

Stage 4 (days 18-21) COCO Marigold™ seedlings develop rapidly and are ready to transplant when they reach 4 inches tall with four true leaves. One can drop the air temperature to 62°F/17°C to hold plug trays for a few days. Avoid temperatures below 60°F/16°C as this will invite disease problems. Do not delay transplanting as root-bound will injure crop quality.

Finished Production:

Spacing: Greenhouse production:

Regular: 5x5” / 12x12 cm & Disbud 4x4” / 10x10 cm

Field production*: Regular 5x5” / 12x12 cm & Pinch 8x8” / 20x20 cm

*best grown in single rows with 12-16” / 30-40 cm between rows

Transplanting: Place the plants slightly deep into the soil as they will root above the stem-soil line. Water immediately as stress severely reduces growth and promotes premature flowering. Transplant on time as overgrown and stressed plants result in less flower production.

Bed Preparation: Heavier clay loam soil generally produces larger and greater number of flowers. In lighter, sandy soil, fertility and moisture are more difficult to manage. Work the soil to a depth of 12-20 inches/30-51 cm. prior to planting. Optimum pH is 6.5 to 7.5.

Netting: Provide support netting to keep the plants straight.

Temperature: Optimum day temperatures are 79-90°F/26-32°C with nights around 68°F/20°C. Warmer temperatures (65-90°F / 18-32°C) will speed up growth in general from plug stage to finish. Cool night temperatures combined with warm day temperatures promote strong plants and larger flowers.

Fertilizer: Nutrition levels in the soil should be moderate at the start. A general recommendation of key elements in dry soil at the time of planting is listed below.

Nitrate Nitrogen	40-80 ppm
Phosphorus	25-60 ppm
Potassium	250-400 ppm
Calcium	2,500-3,500 ppm
Magnesium	300-350 ppm

After transplanting use a well-balanced calcium-nitrate based fertilizer for the first 6 weeks and then finish with a high potassium formulation. Under-fertilization creates small plants and flowers, while over-fertilization (especially with nitrogen) promotes excessive vegetative growth and fewer flowers. Soil and tissue analysis are the best way to determine if the plants are receiving optimum nutrition. *Tagetes erecta is very sensitive to a deficiency of calcium and boron.* Calcium promotes strong cells and reduces calyx breaking. Boron promotes strong tissue in xylem and phloem. To ensure an adequate supply, calcium and boron may be applied as a spray to the plant starting 10 days after transplant and continuing every 10 days until blooming.

Pre-Plant Fertilizer: Incorporating a granular fertilizer, such as 16-20-10, at 300-330 lbs./acre is a common practice in California to improve plant growth, vigor, flower size and yield.

Flower Development: The rate of flower development is related to the day length and temperature. Day lengths of 12 hours* or more are recommended for optimum growth.

- Short days (< 12 hours) accelerate flower bud development. Under these conditions the plants will flower earlier on shorter plants and yields may be reduced.
- Long days (>12 hours) will slow flower bud development. Under these conditions the plants flower later on taller plants.

*When the photoperiod is less than 12 hours, light the crop beginning at transplant for 30-40 days or until flower buds appear. Night interruption for four hours (22:00 – 02:00) or day length extension to provide 15 hours of light per day is recommended. Cyclic lighting for 6 hours (21:00 – 03:00) with 15 minutes on and 15 minutes off is also effective.

Greenhouse Production

Production Type	Weeks from Sow	Comment
Spray (regular)	13-14 weeks	Space 5 x 5" / 12 x 12 cm.
Disbud	11-12 weeks	Space 4 x 4" / 10 x 10 cm. Day 14 after transplanting start to remove lateral stipules and keep watching continuously every week until blooming.

Field Production

Production Type	Weeks from Sow	Comment
Spray (regular)	13-14 weeks	Space 5 x 5" / 12 x 12 cm.
Pinch	15-16 weeks	Space 8 x 8" / 20 x 20 cm. Day 14-21 after transplanting pinch the tip to leave 4-5 lateral shoots.

Harvesting: For local markets, cut stems when the flowers are almost fully open with an inch / 2.5 cm. of green showing in the center. For storage and shipping, harvest when 50% of the petals have opened.

Post-Harvest: Harvest in the afternoon for the longest vase life. Recut stems when they are out of water for any duration. For the best vase life, pretreat with a commercial hydrator for 4 hours followed by two days treatment with a commercial holding preservative. Slow-release chlorine tablets are particularly effective. Marigolds store dry well.

Insects: Borer, bud worm, leaf chewer, red spider, thrip

Disease: Alternaria, blight, botrytis, leaf spot, phytophthora, pythium

Culture Watch Point: A rupture or cracking of the flower calyx sometimes occurs when the flower petals develop faster than the calyx. Below is a list of reasons which should be avoided.

- Calcium deficiency and nitrogen excess
- Applying excess water to the soil after flower bud initiation.

Note: Greater risk under long day length, warm temperatures and high humidity or with disbud cultivation which produces a larger flower. Therefore, applying sufficient calcium and avoiding excess nitrogen and excess water after flower bud initiation is key to reducing the problem of calyx breaking.

Recommended range of leaf tissue analysis for Tagetes erecta.	
Element	African Marigold
Nitrogen (%)	2.20 – 5.50
Phosphorus (%)	0.23 – 0.67
Potassium (%)	1.50 – 2.19
Calcium (%)	0.88 – 2.74
Magnesium (%)	0.35 – 1.56
Sulfur (%)	0.18 – 0.88
Iron (ppm)*	45 – 454
Manganese (ppm)	4 – 385
Zinc (ppm)	22 – 235
Copper (ppm)	5 – 143
Boron (ppm)	15 – 49
Molybdenum (ppm)	0.1 – 0.60

Source: Bryson and Mills (2014)
*Iron levels exceeding 1,000 ppm are considered toxic (Albano et al., 1996)

“All information given is intended for general guidance only and may have to be adjusted to meet individual needs. Cultural details are based on North American conditions and Sakata cannot be held responsible for any crop damage related to the information given herein. Application of recommended growth regulators and chemicals are subject to local and state regulations. Always follow manufacturer's label instructions. Testing a few plants prior to treating the entire crop is best.”