

Gerbera
Practice & Theory
Selected chapters:

Breeding gerbera -
Seed-production
& Selecting.

A lecture for Israeli
plants breeders.

June 2013

Translated to English,
August 2018

Revised January 2021

Photos by the author.

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Lecture - 5

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Selected gerbera seedlings
of Gerbera Breeding Ltd.
November 2012

The Gerbera plant - “Transvaal Daisy”

Family - Asreraceae (a branch of the Compositae).

Origin of G. jamesoni - S. Africa, Mpumalanga Province, (*in the past Transvaal Province*).

In culture - Hybrids of G. jamesonii - X - G. viridifolia.

A perennial plant - With long-live rhizomes and long-live adventitious roots.

Self-inductive plant type - As regards the flowers initiation and production phase.

Morphology - Short branches (2 - 5mm), carrying only 4 emarginated leaves, and 2 flowers-stems per branch without leaves. The Inflorescence - *includes over 800 flowers*.

Flower-stem - one-internode, 20 - 80cm long, without leaves.

Seed Production - in culture manual Pollinating is required.

Genetic order - Avoids self-pollinating, on the same inflorescence.

Reason: *The readiness of the **Stigmas** of the external female flowers circles, **preceding** the **Anthers** maturation, of the inside male flowers on the original same inflorescence.*

(see slide 28)

An intensive modern plant would probably declare:

That in order to get the maximal production and its quality, all it needs is:

‘OPTIMAL GROWING CONDITIONS’

It is our goal to realize what are the optimal growing conditions for our plants, and how to create them and control them.

Full disclosure:

All the plants displayed in this paper, grew under optimal growing conditions, created and controlled by an ‘AutoAgronom’ irrigation control system. Yoseph Shoub ©



The juvenile branch structure of a sprouting gerbera seedling.

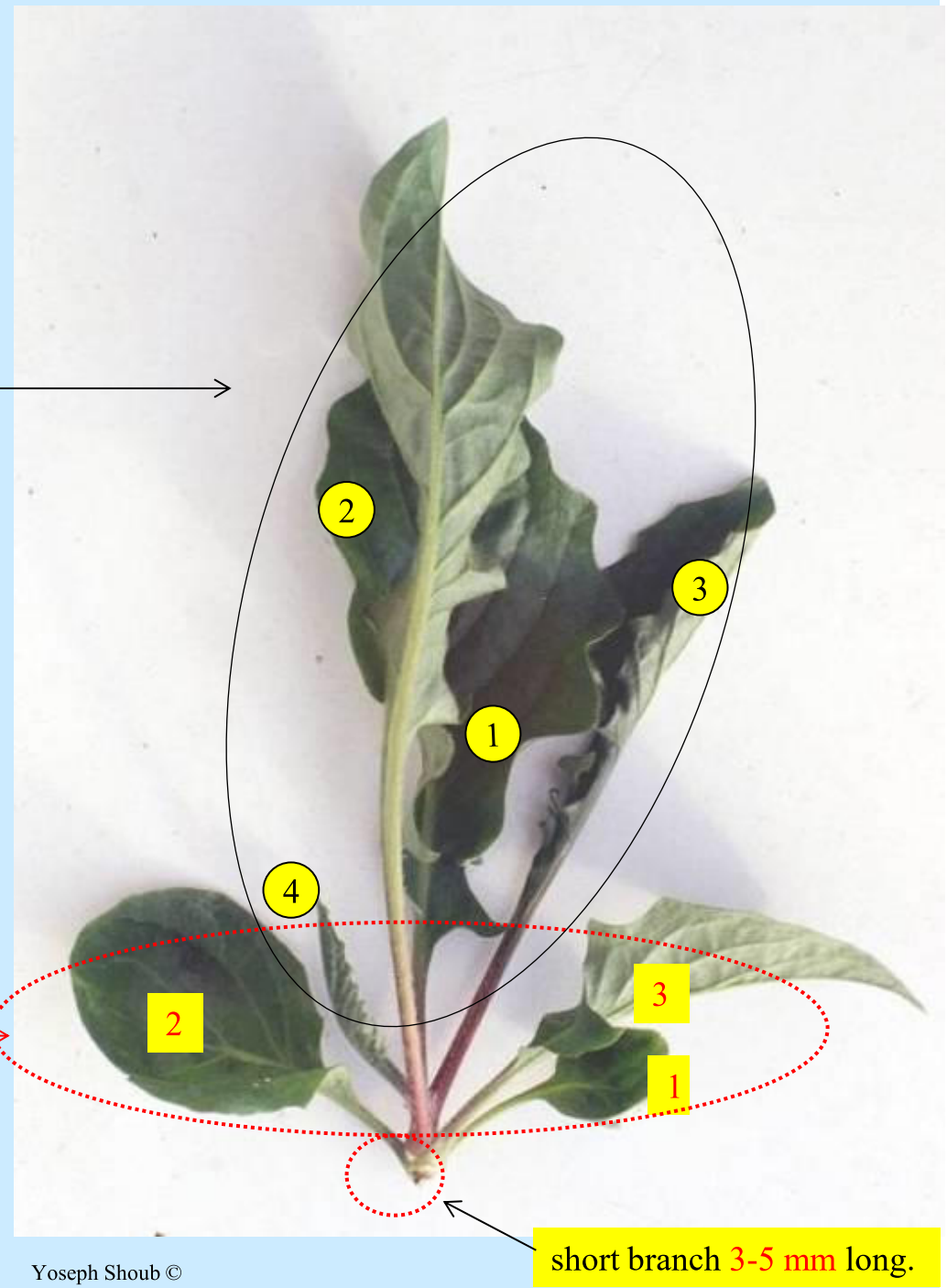
The primary branch of a gerbera seedling (*in the photo*), has 3 Juvenile round leaves.* **1-3**
Above them are the 4 regular emarginated mature leaves. **1-4 !**

The branch is a short compressed-tissue (**3-5 mm** long).

! Mature gerbera plants produce short branches that carry only 4 leaves

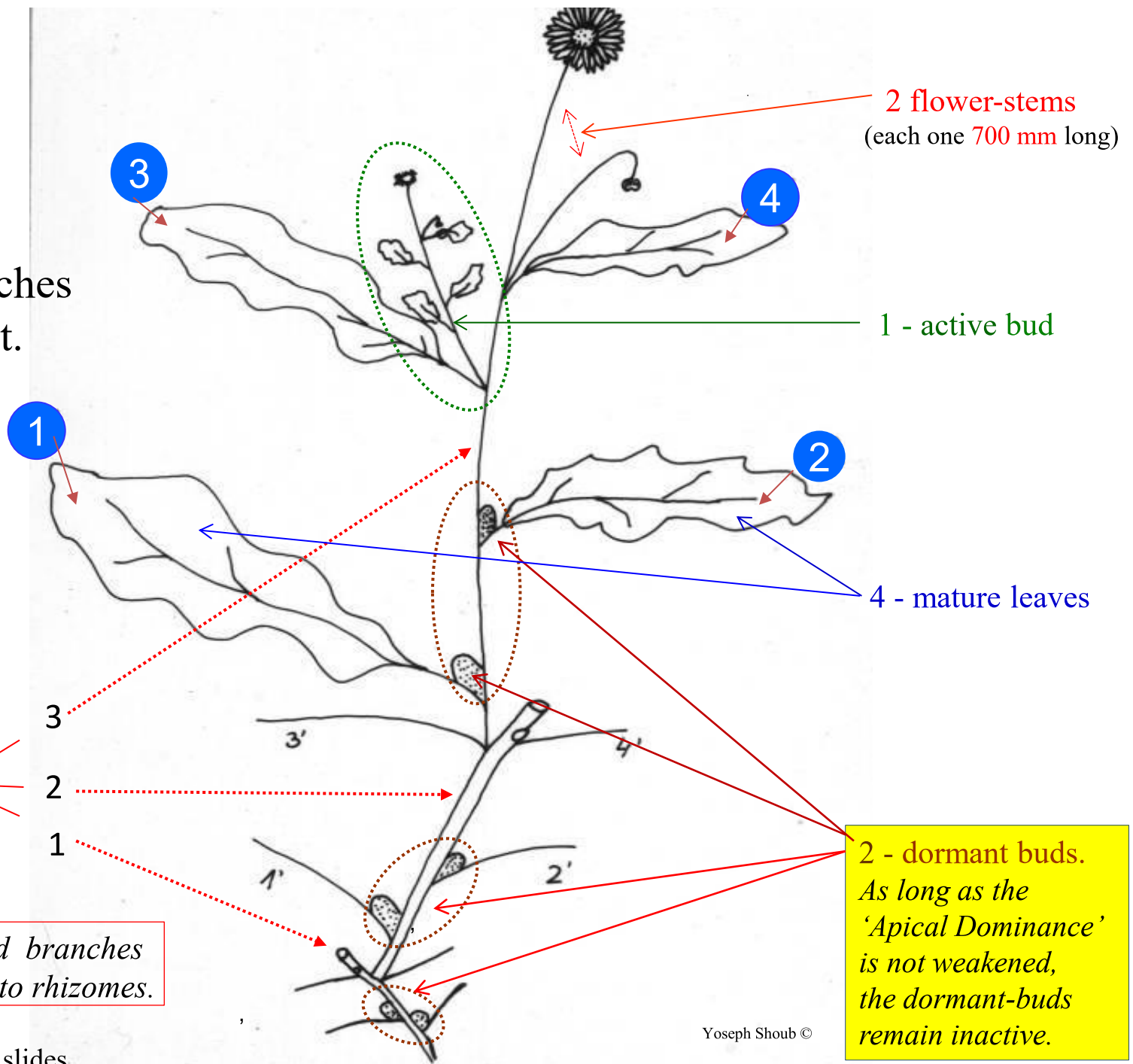
2-3 round 'juvenile leaves

**Round juvenile leaves are also the typical leaves of young tissue-cultured gerbera plantlets.*



A Scheme of The mature branches of a gerbera plant.

(each one 3-5 mm long)



2 flower-stems
(each one 700 mm long)

1 - active bud

4 - mature leaves

2 - dormant buds.
As long as the 'Apical Dominance' is not weakened, the dormant-buds remain inactive.

A scheme of the 3 most recent branches.

The compressed branches turn gradually to rhizomes.

See next slides

The Gerbera Rhizome -

As a perennial plant in nature, and in culture in open spaces (*as in tuff and other media*), the mature gerbera plant expand its living space by horizontal superficial branches that develop below the soil surface.

Young 'flowering-branches grow upward at the edges of the growing centers. The flowering branches produce also the new adventitious roots.

In culture, soon after planting these branches develop into thickened rhizomes that can survive and act for many years, depending on the available growing space and media volume.

In practice; growers grow gerbera plants, at the most, 2 - 3 years.

In breeding systems; we able to split 2 - 4 years old rhizomes, for increasing the number of the new selections, and to get enough plant material needed technically by the propagation laboratory.

The mature gerbera rhizomes are built of many compressed subsoil branches, carrying many adventitious 'Fibrous roots', and active 'Growing centers' on their upper edges.



Yoseph Shoub ©

About 12 - 16 growing centers of 3 years old plant in Coco-peat. (*The rhizomes are inside the containers' volume.*)



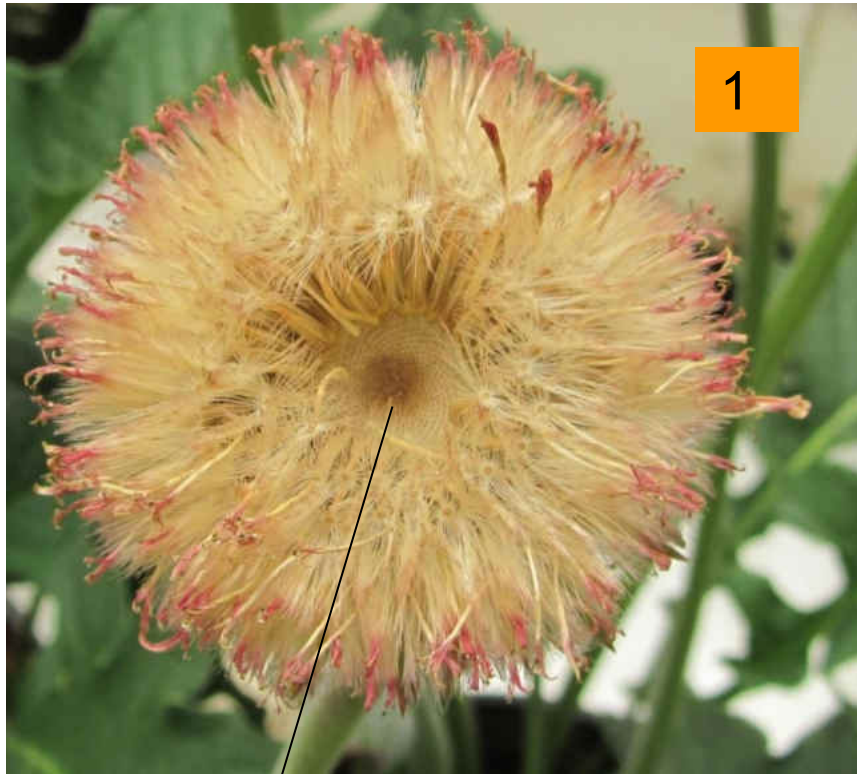
5 Years old plant rhizomes grew in open bed in Tuff, carrying many adventitious roots - older than 4 years.

Seed production, Seedlings phase, Selecting the candidates -

As a perennial plant; the current gerbera does not invest too much energy in its sexual life. As a greenhouse-crop it does not produce seeds voluntarily as it does in its home-land. Therefore the "Pollination" action - the first step of seed production - depends on the breeder's skill, and it is the breeder who does the work.

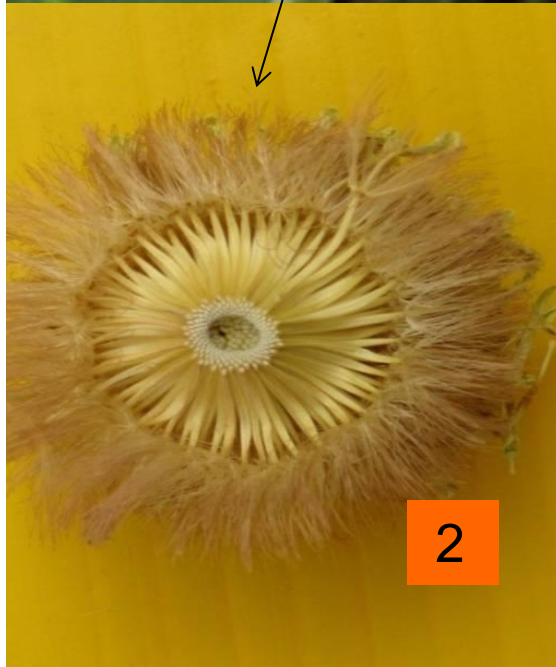
The selection work starts with a large seedlings population. It continues in the next season with 2 - 3% of the primary selected specimens, now 'Selections'.

These selections are trialed in our greenhouse, at least 2 - 3 more years, evaluated according to our parameters that cover the essence of our breeding goal. Plant material of these Coded-Selections is send to AVT (*Plant Biotechnology in India*). A Year or two later, plantlets of the 'Selections' are trialed by us in our greenhouse and by Selecta-One in its trial sites.



Seeds maturation stages of a fertile flower.
(days) after pollinating:

1. (12 -15) the female flowers and the floating-hairs dries.
2. (18) dry male and androgynous flowers are removed (they do not produce seeds).
3. (21) the mature seeds are ready to be harvested as they are easily detached.
4. An empty Receptacle (inflorescence head.)

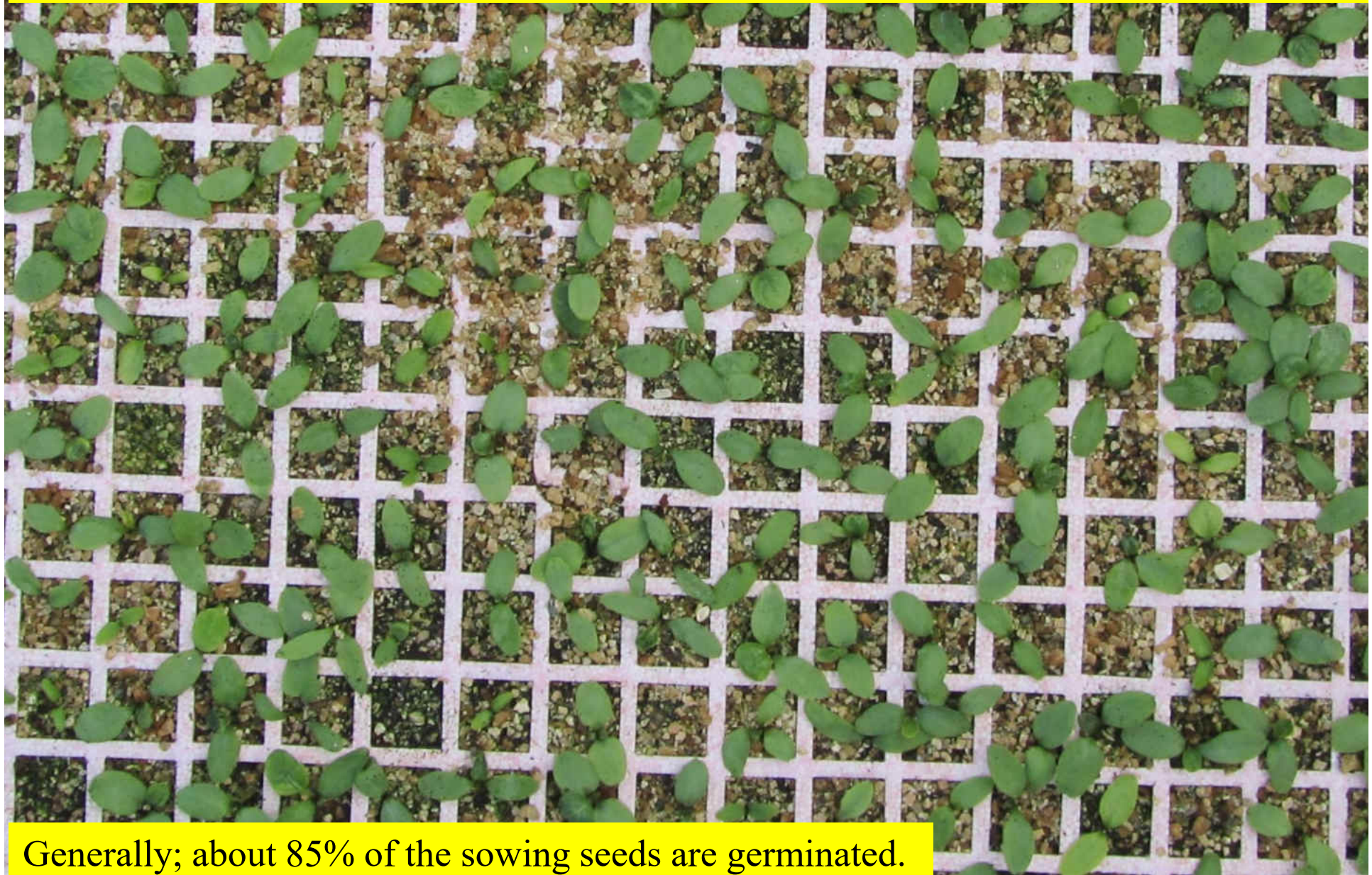




Gerbera seeds. Dried seeds are stored in a refrigerator (6 -10C) in closed packages, longer than 1 year.

Yoseph Shoub ©

Sprouting gerbera seedlings in 'speedlings' pallet, 3 weeks after sowing. Yoseph Shoub ©



Generally; about 85% of the sowing seeds are germinated.

The roots functioning qualities of the gerbera - as a selecting criteria.

The growth of the 'Primary-root' of the gerbera seed is lasting only few weeks. It substituted by adventitious roots (*fibrous roots*) which develop quite early from the compressed young internodes of the new established branches. It occurs short time before the initiation of the first 2 flowers stems. The fibrous roots serve the perennial gerbera plant for about (4 – 6) years. They are the basis for the 'Secondary roots system', and they do not split.

The secondary roots are covered by countless tiny 'Roots Hairs' that do the work of absorbing the soil solution. The secondary roots can feel up the total roots wet volume, in condition that the growing conditions in the roots media are continuously optimal.

The vital importance of the secondary roots activities is their ability to absorb and supply - any time - the soil-solution to all the plant's active organs.

For these reasons I decided, first and fore most, that the roots' growth abilities and their functioning values, will guide me as a plants breeder.

We evaluate the secondary roots activities all along the course of the selecting work. winter and summer, at least 2 - 4 years. We start this mission, already on the planting day.

80% of the germinated seedlings are chosen and are planted - 4 plants per container of 4 L. Thus; on planting day we get-rid of about 20% of the seedlings which probably will not produce the desired selected starter plants. (*5% abnormal roots and 15% weak and small plants*). It saves also 20% of the total input in the seedling phase.



Our seedlings on planting day, July 18 2018. 52 days after sowing.

Selecting gerbera seedlings on the planting day.

Ideal root system:
Adventitious roots
Secondary roots,
are on place.

- Selected -

Abnormal root system:
only the primary-root
And the secondary roots
are presence.

- Discarded -



2 days after planting



8 days after planting

Yoseph Shoub ©

A satisfactory Secondary-roots system, assured maximal productive growth.



‘Generally; the roots volume and their transverse expansion, depends on the plant’s age and on the available living space in the growing media. ‘Marinilla’ our variety (*above*), is develops intensively, its rhizomes and its roots system.

In abnormal system, as above*, the growing centers are connected to only one central rhizome, they are not independent as they don’t have their own roots. Thus; It will be difficult for such system to supply the soil-solution for the entire foliage surface area.
*This specimen is one example.

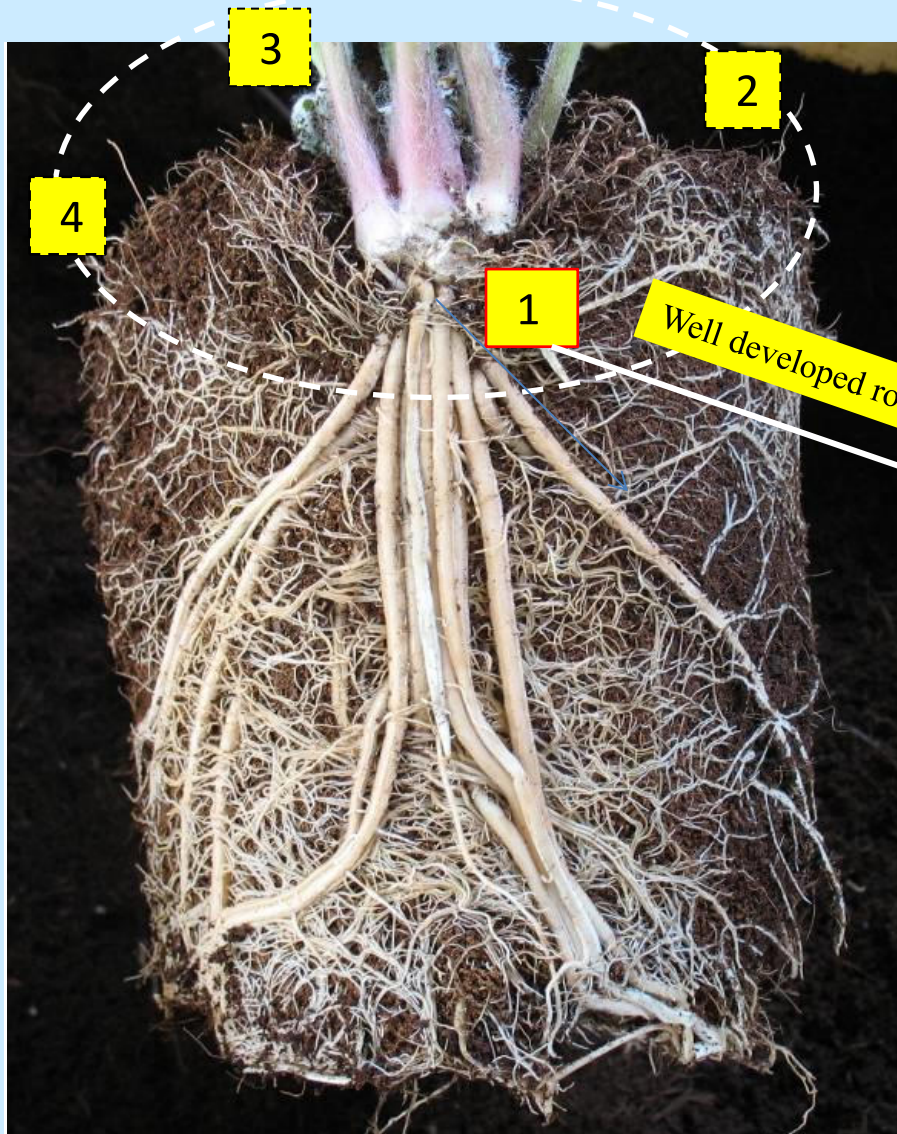


Gerbera seedlings (*4 plants / container*) - 6 weeks after planting, March 2012.



Gerbera-seedlings, 8 weeks after planting. June 2014

Root systems of A Selected gerbera seedling,
1 of the 4 plants grew in the same container.



The Selected seedling, now one in the container
3 months after the transplanting.



A Selected plant, 1 of 4 seedlings planted
100 days ago in 4 L. container.

The selected plant, 3 months after
transplanting to 4 L. container.

Advections roots.

Cross section of
4 years old root system.
20 Oct. 2020

Secondary roots



“Gerbera cultivation in
Soilless media”

A lecture given at:
Horti - Expo Seminar
Kunnar, India Sept. 2012



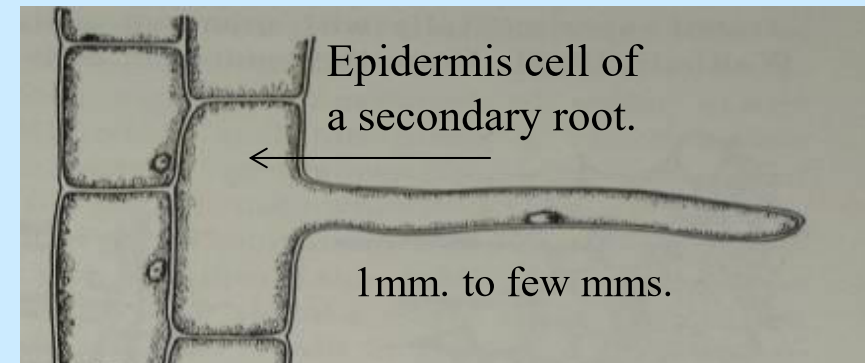
Well developed Secondary Roots of 1 year old gerbera,
in coco-peat, in 4 Liter Rosier ‘Container’.

The 'Root-Hairs' do the work.

Root hairs are elongated epidermis-cells located on the secondary roots.

Their function is to absorb the soil-solution (*water, oxygen and minerals*) into the plant's vascular system.

A scheme of a Root Hair



The productivity of intensive crops, depend to great extent on the continuous activity of the root hairs.



A Secondary root covered by countless Root Hairs, developed by chance below the container basis, as to the optimal humidity conditions. December 2010



Advections roots.

Secondary roots covered
by tiny Root Hairs.

Yoseph Shoub ©

Roots system of 4 years old gerbera in 4L. container in coco peat media. 28 July 2020

The Inflorescence (the flowers Morphology)

Inflorescence of the
original -

Gerbera jamesonii

Originated in

Barberton,

Mpumalanga Province,

South Africa.

In the past:

Transvaal Province.



Gerbera jamesonii seedling in our greenhouse.

Yoseph Shoub ©

Double
Mini - shb* 101 - 49



9 Cm

The new declared “Colombian flare” (May 2018)

* shb in ‘Selecta-one’ catalog = Shoub’s variety.

Yoseph Shoub ©

Single
Mini shb 102 - 39



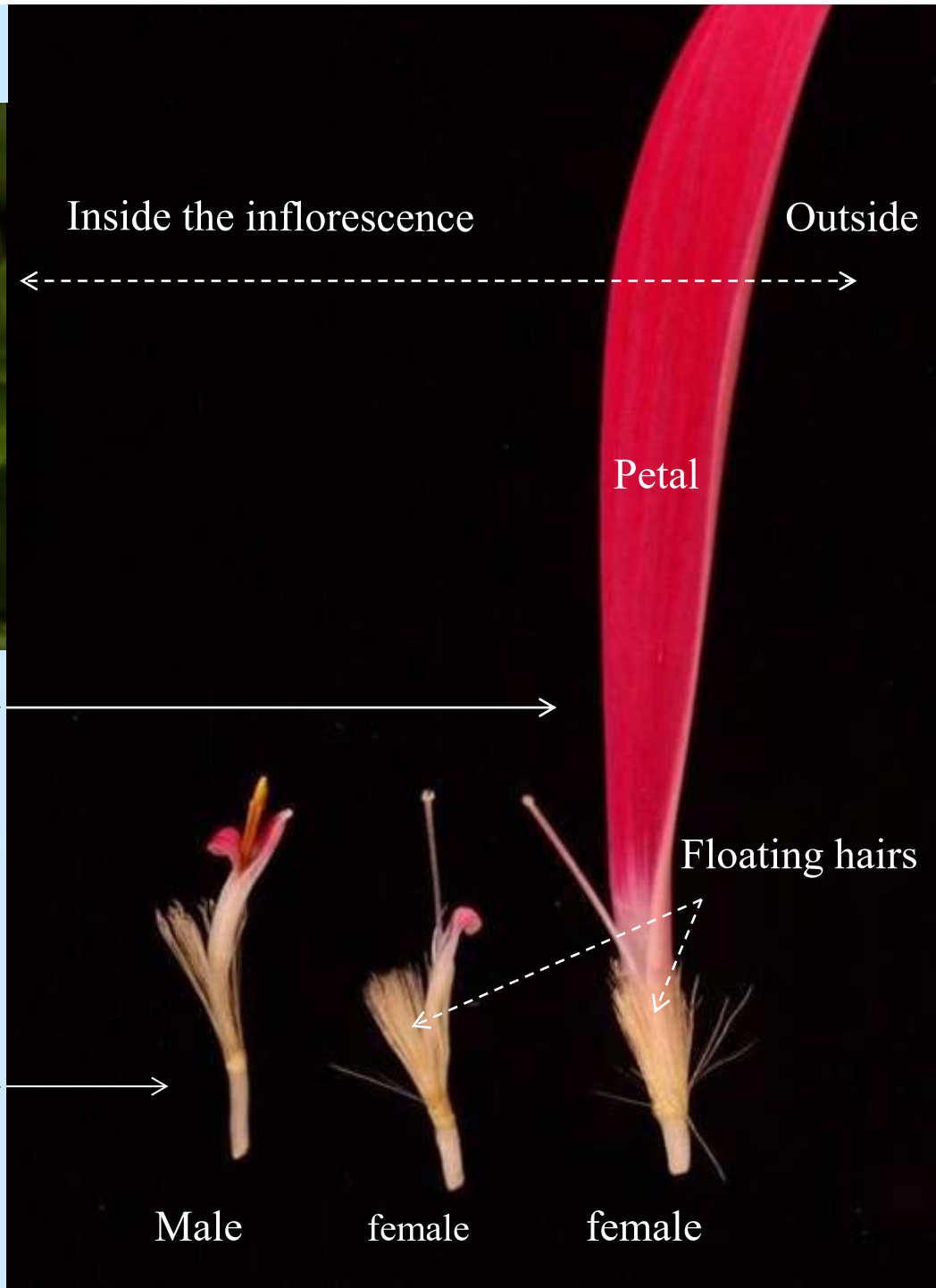
8 Cm

Single-type

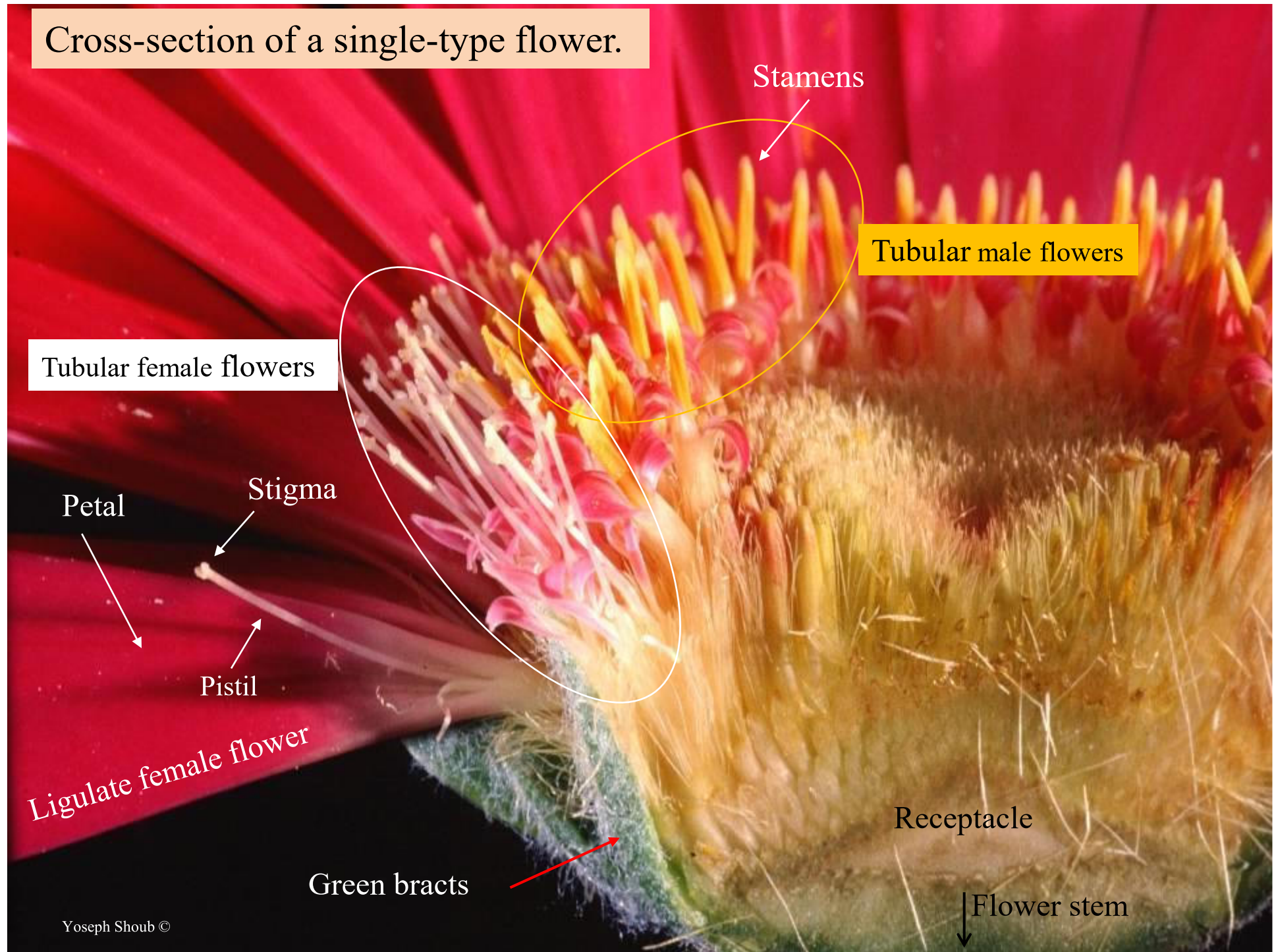


Ligulate flower

Tubular flowers



Cross-section of a single-type flower.



Stamens

Tubular male flowers

Tubular female flowers

Petal

Stigma

Pistil

Ligulate female flower

Green bracts

Receptacle

Flower stem

Double-type

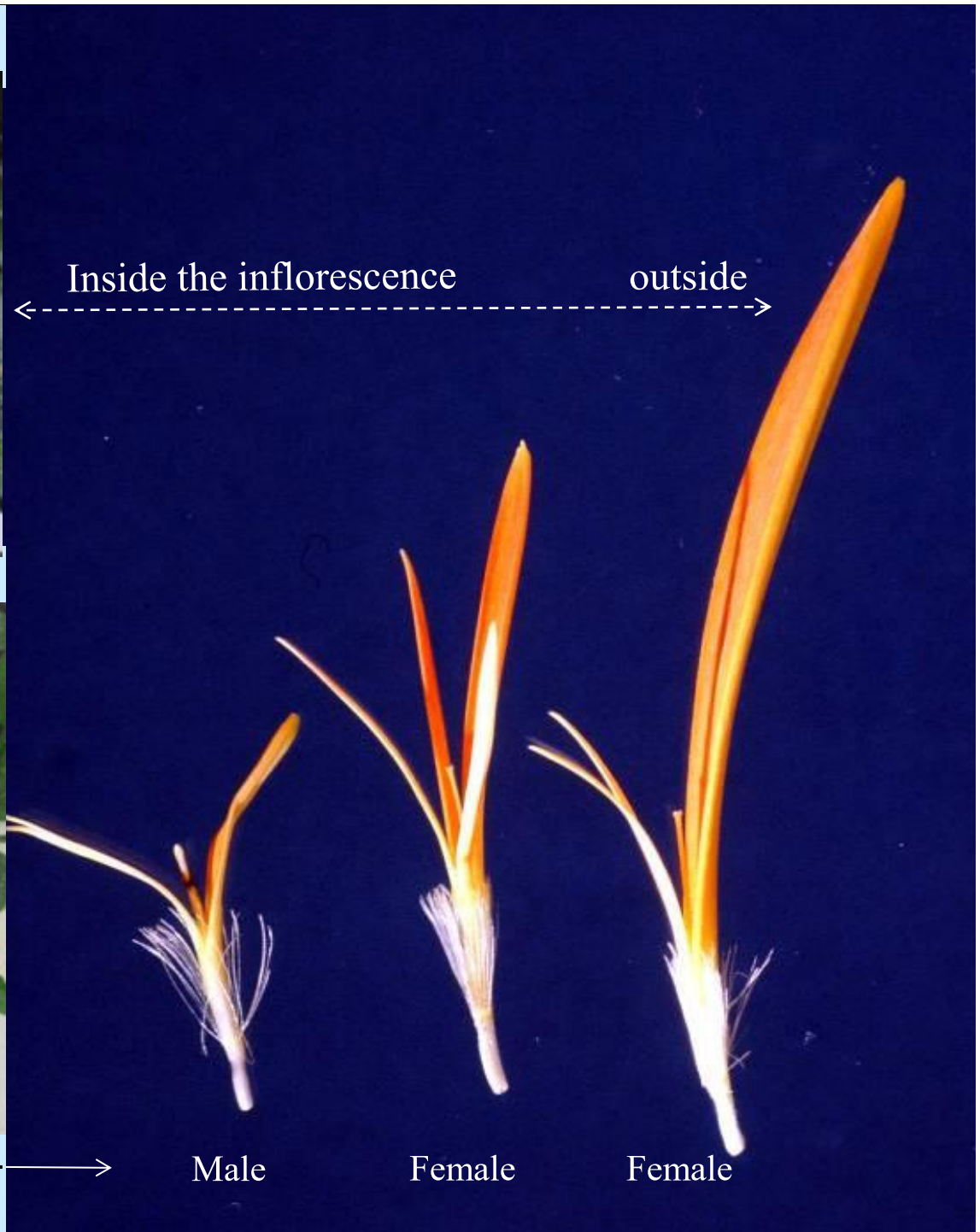


Semi-double type



Only Ligulate flowers

Yoseph Shoub ©



‘Female flowers phase’ of a single-type

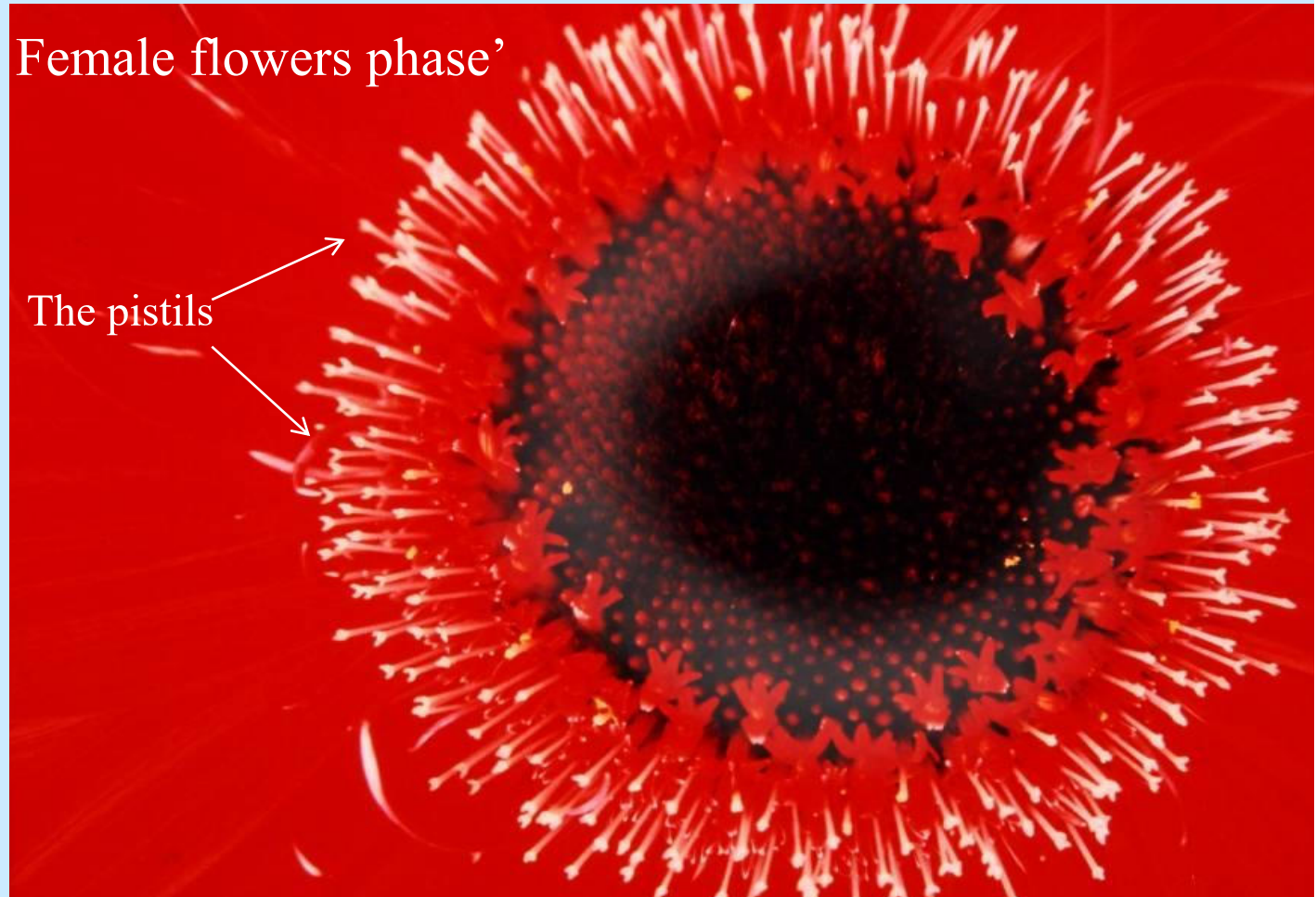
At this phase only pistils are seen, the stamens are not visible yet.

Note - at this phase the stigmas are sticky and are ready for pollinating.

As a general rule -
The flower-stem on
this stage is not yet
lignified, and is not
ready for harvest.



See next slide

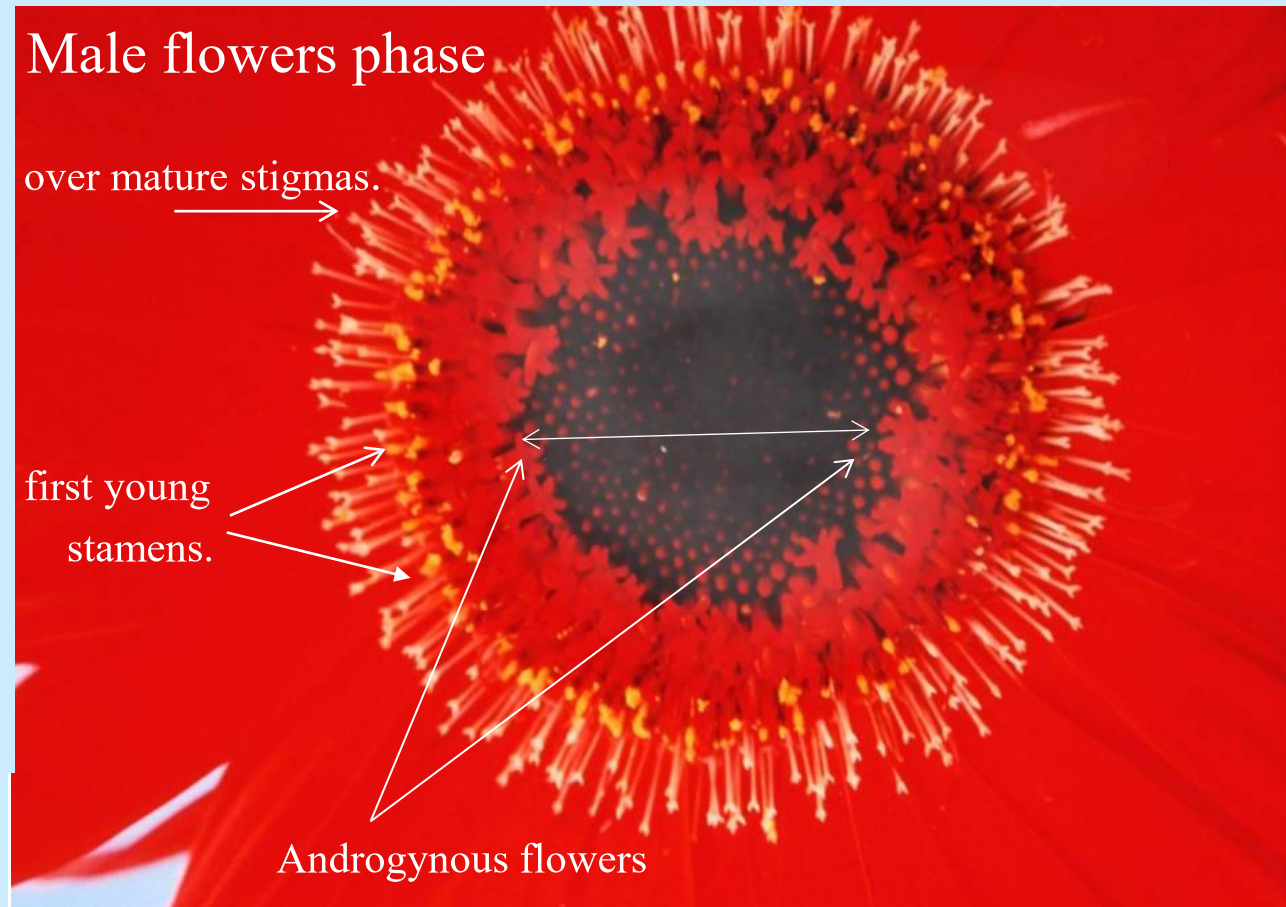


'Male flowers phase' of a single-type

(the same flower, 2 - 3 days later)

The yellow stamens are seen, the anthers release their pollen, the stigmas lose their stickiness, and it is too late to pollinate them.

As a general rule -
When 3 circles of male flowers with mature anthers are seen, the flower stem is strong enough and ready for harvest.





Dear Grower

Your know-how is an accumulated process.
As long it continues, you'll find-out your way
how to create the ideal growing conditions.
Our accumulated experience (*over 58 years*) 1963 — 2021.
is offered to you wherever you are via 'Selecta-one' or directly.

Yoseph Shoub ©

*'Marinilla' (our variety) in sandy soil-beds, 100 days after planting , Israel November 2007.
The growing conditions controlled by AutoAgronom in sandy-soil, are almost secure as in
containers, on account of the buffer-capacity of the soil.*



Our varieties do well in soilless media as well as in the soil.

Yoseph Shoub ©

Rodrigo - shb, in soilless media (= Hydroponics in solid media),
4 months after planting, Colombia, March 2004



