Fatty acid composition of Linola with 5 major vegetable oils (%)

Crop	Saturated	Mono unsaturated	PUFA		P/S
		Oleic	Linoleic	Linolenic	
Linola	10	17	71	2	7.3
Safflower	10	14	76	Trace	7.6
Sunflower	12	16	71	Trace	6.0
Maize	13	29	57	1	4.5
Soybean	15	23	54	8	4.1
Canola	7	61	21	11	4.6

Lesson 9

Niger

Guizotia abyssinica

Niger

- An oil seed for poor soils and coarse texture
- It is the crop suits in soils wherein all other crops are not possible
    - Like Horsegram in the tropics
- It is a minor oil seed cultivated in smaller area of the world

Importance of Niger

- Primarily (75%) for oil extraction
- Also used as food including confectionaries (18%) in India
- It is feed to birds in western countries
    - Export value for India
- Plant is feed to sheep but only silage to cattle
- Cake is valuable cattle feed
- Seed contains 35-40% oil
- Oil is pale yellow with nutty taste and a pleasant odour
- Keeping quality is poor due to oxidative rancidity
    - Olieic acid 38%, Linoleic acid 52%
- Oil is used for
    - Culinary purpose
    - For anointing the body
    - Manufacture of paints and soft soaps
    - Lighting and lubrication
- Niger oil is a good absorbent of fragrance
    - Used in perfume industries

- Oil a substitute for sesame oil in pharmaceutical purpose
- Niger based agar medium
  – to distinguish *cryptococcus neoformans*, a fungus that causes a serious brain ailment

Distribution and area of Niger in the world

Major countries:

- World area is around 1.0 million ha
- India & Ethiopia posses the major area
  - In Ethiopia it is cultivated in water logged soils where most other crops fail to grow

Other Countries:

- Sudan, Uganda, Zaire, Tanzania, Malawi, Zimbabwe, Pak, West Indies, Nepal, Bhutan & Bangladesh

Niger area in India (million ha & million t)

States	Area	Production	Productivity
MP	0.20	0.043	0.215
Orissa	0.15	0.047	0.309
Maharastra	0.06	0.019	0.280
Karnataka	0.04	0.008	0.182
All India	0.52	0.150	0.286

Other states which also cultivate niger are Bihar, AP, Assam & WB

Origin

- From the highlands of Ethiopia
- From Ethiopia migrated to East Africa
- During the beginning of 2nd millennium BC to India

The Plant

- Annual dicotyledonous herb
- Seedlings
  - Pale green to brownish hypocotyls and cotyledons
  - The cotyledons remain on the plant for long time
- First leaf is paired and small
- Successive leaves are larger and opposite
- Leaves are sessile, lanceolate
- Softly hairy on both surfaces
- Dark green is usual color
- But lower leaves pale yellow
  - The stem is usually round, smooth to slightly rough
- Approximately 1-2 cm diameter
- Can grow up to 1.5 m
- Stem are hallow and break easily
- Color is green to reddish green

- Moderately branched
    - The capitula are surrounded by leafy involucres bracts
- Outer bracts being leaf like
- Inner smaller and finally merges with flattened paleas
    - The fruit is achene, typical of the composite, small.
    - Seed is 3-5mm length and 1.5mm width, lanceolate in shape
    - The testa is hard, glossy, and usually black
    - Normally 1000 seeds weighs 3-5g
    - There are 15-30 seeds/head
        - Sometimes more with immature seeds

The Climate

- It is temperate region crop
- Adapted to semi-tropical
- Performance is better between 500 -1000m elevation though suits up to 2500m
- Moderate Temp during growth
    - 18-23°C
    - >30°C growth adversely affected
    - Indian strains are less affected by temp compared to Ethiopian
- Frost will kill the young plant
- 1000-1300 mm RF can be tolerated but not >2000mm
- Peak flowering should not coincide with heavy rain
    - High wind – seed shattering
- Tolerates excess moisture and drought

The soils

- On wide range of soils
- Light textured soil but well drained heavy soil is also suitable
- pH 5.2 – 7.3
- Can tolerate water logging
    - Under waterlogged soil it develops aerenchyma cells
- It can grow in saline but increased salinity
    - Flowering gets delayed
- It can under dry soil
    - but not a dry land crop

Management

- Field
    - It is small seed hence requires fine seed bed
- Season
    - Aug-Sep
    - After a Kharif crop or early Rabi
- Varieties
    - No 71
    - IGP 76
- Spacing & Seed rate
    - 5 to 8 kg

        - Row width varies from
            - 20 to 30cm
        - Between plants
            - 10 or 15 cm
    - Method of sowing
        - Most common is broadcasting
        - Drilling by seed drill is advanced and more useful
        - Depth of sowing 1-3cm
    - Seed treatment
        - With fungicides
        - Void mixing with fertliers

Nutrient management

- Cultivated in poor soils with less input due to
    - Poor economy of the farmer
    - Poor economic return of the crop
- Response to fertilizers in rainfed is poor
- A schedule of
    - 20:20:0 is recommended
        - N in two splits, at sowing and 30 DAS
        - K is recommended in Karnataka @ 10kg
    - 40:40:0 is recommended in Orissa

Weed management

- Niger grows rapidly and covers quickly the surface
- One or two weedings – sufficient
- Dodder (Cuscuta) infested areas are there (Orissa)
    - Cuscuta free seeds
    - Herbicide Chlorpropham G at dodder germination @ 4kg /ha
    - Pronomide @ 2kg/ha as pre-emergence soil treatment or as foliar spray 20 DAS

Water management

- Very rarely grown as irrigated in India
- Crop is sensitive to moisture stress at early stage
- Schedule according to soil and climate
- Further research needed in this area
- Check basin or border strip is ideal methods

Maturity & harvest

- Duration varies 80-145 days
- Delayed harvest leads to shattering
- Seeds are loose in head, hence over maturity leads to grain shattering (25%)
    - When the leaves dry up, harvest it
- Harvesting like gingelly,
    - When the bud moisture is 45-50%
- Stacking in the floor for a week and drying and cleaning, as usual

Yield potential

- Normally 300-500kg but up to 1000kg/ha
- When intercropped

- 400 kg with sunflower
- 100 kg with sorghum

Cropping systems

- Sequential cropping
  - Little millet or finger millet – Niger
- Intercropping
  - Niger + sunflower (4:2)
  - Niger + soybean (2:1)
  - Niger + peanut (2:2)
  - Niger + blackgram (3:3)
  - Niger + castor

Cropping systems

- Preceding pulse is more remunerative than sole crops

Some more edible oil seeds

Oil Palm

Elaeis guineensis

- Originated in West Africa
  - But has planted successfully in tropical regions within 20 degrees of the equator
- An oil produced to 21.5million t in 2000
- Area grows annually by 2%
- World's largest producer and exporter - Malaysia - 47%
- Indonesia is the second largest world producer -36%
- Both are expanding their palm oil production
- Both pulp and seed contains oil
  - Pulp contains 20%
  - Seed 1.6%

Simarouba

Simarouba glauca

- Paradise tree
- Edible oil 42% by seed and 65% kernel
- Introduced into India

Olive *(Elaeagnus angustifolia L.)*

- Olive oil is an oil derived from the fruit of the olive tree, which originated in the Mediterranean area.
- It has a very high content of monounsaturated fats.
- Nowadays, olives are ground to tiny bits, obtaining a paste that is mixed with water and processed by centrifugation, separating the oil from the pomace (the other remaining substances).
- Edible commercial olive oil can be divided into several categories according to its chemical characteristics and the production method:
  - Extra Virgin Olive Oil,
  - Virgin Olive Oil, and

    - Olive Oil.
- The first two, virgin olive oils, are obtained only by physical extraction from the fruits.
- Non virgin olive oil is obtained by the chemical refining of a low-quality non-edible grade of virgin olive oil called "lampante" olive oil

The list enlarges this way:

- Corn oil
- Soybean oil
- Rice bran oil
- Coconut oil