IIT KHARAGPUR

NPTEL ONLINE CERTIFICATION COURSES

Organic Farming for Sustainable Agricultural Production

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Lecture 26 : Organic Field Crop Management (pulse and oilseed crop)

Arhar (*Cajanus cajan*)

Family: Leguminosae

Origin: India

Climatic Requirements

- Pigeonpea can be grown between 14°N and 28°N latitude, with a temperature ranging from 26° to 30°C in the rainy season (June to October) and 17° to 22°C in the postrainy (November to March) season.
- The length of growing season extends from 120 to 180 days.
- Pigeonpea is very sensitive to low radiation at pod development

Soil

- It is grown well on a wide range of soils varying from sandy loams to clay loams.
- It does best on fertile and well drained loamy soils.
- The saline-alkaline and waterlogged soil unfit for its cultivation, as they adversely affect nodulation.
- Optimum pH range is 5.5-7.5.

Land Preparation

- Land preparation for pigeonpea requires at least one ploughing during the dry season followed by 2 or 3 harrowing.
- The "summer" plowing helps in minimizing the weed flora and to conserve moisture.
- Well-drained soils are necessary for good root and nodule development.
- Ridge-and-furrow system are useful in preventing water logging by draining excess surface water and in preventing soil erosion.
- In acidic soils 2-4 t ha^{-1} of lime is incorporated 3-4 weeks before sowing to neutralize the acidity.

Fertilizer management

- Use of green manure crops. Taking advantage of monsoon showers sow 1-2 kg seeds each of Sunhemp, Sesbania, Horse Gram, Cow pea, Green gram and Black gram and allow them to grow for 30 days. Incorporate this green manure crop into the soil by shallow tilling during first week of July and go for red gram sowing after 7-8 days of incorporation.
- Addition of Neem leaf/seed manure at 5-10 quintal/ha has also been found to be beneficial not only in terms of increased nutrient supply, but also in terms of reduced problem of soil borne pathogens and nematodes.
- Liquid manure prepared from cattle dung and cow urine is a key on-farm input in fertility management of soils under organic management.

Neem leaf/seed manure

Liquid manure

- Amrutpani(0.25 kg ghee, 0.5 kg honey, 10 kg fresh dung, 200 litres of water), a soil tonic can also be used in soil application. Minimum of three applications, first at the time of sowing, second after 25-30 days (after first weeding) and third after 50-60 of sowing (after second weeding).

- Foliar spraying of Panchagavya (Cow dung - 7 kg, Cow ghee - 1 kg, Cow Urine - 10 litres, Cow milk - 3 litres, Cow curd - 2 litres, Water - 10 litres,) @ 3% at 10-15 days interval from 1st month after sowing

NUTRIENTS MANAGEMENT

Chemical Properties	Conventional VC (%)	Microbial Enriched VC (%)	Rock enriched VC (%)	FYM
Total N	1.3-1.5	1.8-2.4	1.4-1.5	0.5
Total P	0.8-1.0	0.9-1.3	2.9-3.5	0.2
Total K	1.0-1.1	1.1-1.60	2.8-3.5	0.5

SOURCE	DOSE, Based on P content
Conventional VC	3 tonnes/ha.
Microbial Enriched VC	2 tonnes/ha
Rock enriched VC	1 tonne/ha
FYM	13 tonnes/ha
Chemical fertilizer	30-60-40 kg of $N:P_2O_5:K_2O$

Disease and Pest Management

Pod borer or Boll worm (Helicoverpa), aphids, jassids, thrips, mites, etc are some of the important insect pests of red gram. Fusarium wilt disease can also be a serious problem in some places.

Preventive Measures

- Intercropping of red gram with soybean, moong, ground nut, sorghum/maize and planting of marigold in bunds helps in keeping the pest population under control.
- Release of *Trichogramma* 50,000 eggs (2-3 cards) after 30 days of sowing can keep the problem of pests below threshold level.

Curative Measures

- 2-3 Sprays of 5% Neem seed kernel extract (NSKE) at an interval 15 days.
- NSKE enriched with 5% cow urine has been found to be more effective. The Azadirachtin in the NSKE controls the boll worm and other sucking pests.
- Alternatively, 20 kg of Neem leaves boiled with 100 liter water can also be used.
- Alternatively, Garlic, Chili and Neem crushed in cow urine can be sprayed on leaves.

Groundnut (*Arachis hypogeae*)

Family: Leguminosae

Climatic Requirements

- Requires a long and warm growing season.
- Requires at least 50 cm rainfall during growing season, more sunshine and relatively warm sunshine.
- Optimum temperature range is 21-26.5 °C

Soil

- Well drained sandy and sandy-loam soils are best suitable.
- Heavy soils interfere peg development.
- Optimum pH is between 6.0-6.5

Land Preparation

- Deep ploughing should be avoided in Groundnut due to its pod-forming habits. This is due to the fact deep ploughing encourages development of pods in deeper layers of soil which makes harvesting difficult.
- One ploughing with soil turning plough followed by two harrowings is best for the crop.
- 1-2 summer ploughings will minimize weeds and insect pests.

Nutrient Management

- In groundnut, application of FYM at 10 to 15t/ha increased the pod and haulm yields and improved the yield parameters like shelling percentage, 100 seed weight and sound mature kernel compared to the recommended dose of fertilizers.
- Foliar application of cow urine @ 10 % and Panchagavvya spray @ 3% as a source of nutrient and growth promoter at 45 and 60 DAS.

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Disease and Pest Management

- Use of pheromone traps @ 5 per hectare for monitoring of S. litura.

- Neem seed kernel extract @ 5% as a foliar spray at 45 and 60 DAS against management of defoliators.

Groundnut leaf miner (*Stomopteryx subsecivella*)

Cultural Control

- Stray planting of cowpea or soybean as trap crop.
- Crop rotation with non leguminous crop is advised in case of severe recurring problem.
- Crop rotation of groundnut with soybean and other leguminous crops should be avoided.
- Use resistant/tolerant varieties.

Mechanical Control

- Collect and destroy egg masses and early instars larvae.
- Install pheromone trap @ 5/ha for mass trapping.
- Spray neem based formulation @ 5%.

Biological Control

- Release *Trichogramma Chilonis* @ 50000/ha twice (7-10 days interval)

- Conserve the natural bio control population of spiders, long horned grasshoppers, praying mantis, robar fly, green lace wing, damsel flies/dragon flies, flower bugs, shield bugs, lady bird beetles, ground beetle, predatory cricket, earwig, braconids, trichogrammatids.

- Mulching with rice straw causes reduction in leaf miner incidence and increase in percentage parasitism.

- Intercropping groundnut with *Pennisetum glacum* enhanced the parasitoid *Goniozus spp*. on leaf miner.

Tricho card

Red Hairy caterpillars (*Amsacta albistriga*)

Cultural Control

- Deep summer ploughing
- After the kharif crop, the field should be ploughed to expose the pupae to predatory birds
- Early sowing is done to escape insect pest damage.
- Inter crop one row of castor for every 5 or 6 rows of groundnut.
- Crop rotation with sorghum/pearl millet or maize should be followed.
- Vegetative traps utilising Jatropa or Ipomoea prevent the migration of the grown up larvae.
- Irrigate once to avoid prolonged mid season drought to prevent pre-harvest infestation.

Mechanical Control

- Install of 12 light traps/ha.
- Erection of light traps soon after the monsoon for 20-45 days and collecting and killing of adult moths are found very effective.
- Collection and destruction of egg masses in the fields around light trap areas.

Biological Control

- Release of *Bracon hebetor* @ 5000/ha in two times at 7-10 days interval.
- Conserve dominant predators like *Coccinella* sp. and *Minochilus sexmaculata* and parasitoids like *Chelonus* spp.
- Conserve the bio control population of spiders, long horned grasshoppers, praying mantis, green lace wing, damsel flies/dragon flies, flower bugs, shield bugs, lady bird beetles, ground beetle, predatory cricket,
- Use 5% neem seed kernel extract on need basis.

Bracon hebetor feeding on a pest larva

Late leaf spot

Cultural Control

- Use of resistant/tolerant varieties wherever late leafspot is severe.
- Intercropping pearl millet or sorghum with groundnut (1 : 3) is useful in reducing the intensity of late leafspot.
- Crop rotation with non-host crops preferably cereals.

Mechanical Control

Deep burying of crop residues in the soil, removal of volunteer groundnut plants are important measures in reducing the primary source of infection.

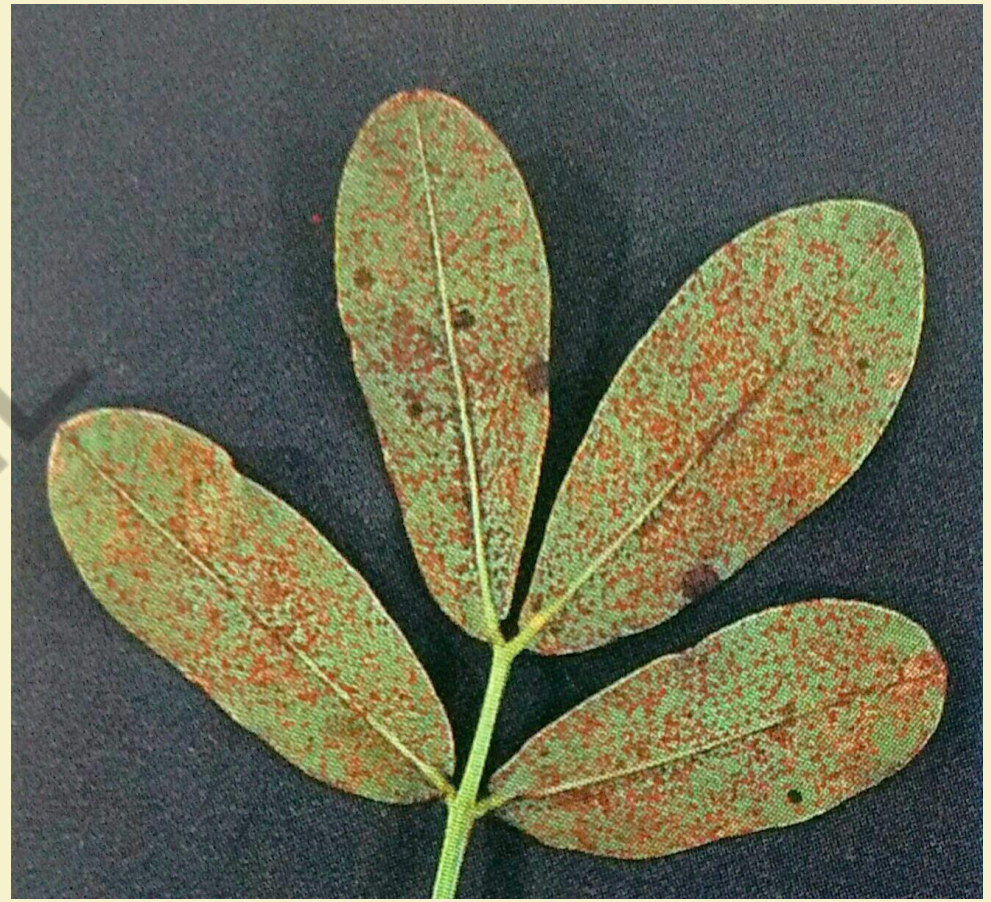
Biological Control

Foliar application of aqueous neem leaf extract (2-5%) or 5% neem seed kernel extract at 2 weeks interval 3 times starting from 4 weeks after planting.

Rust

Cultural Control

- Crop rotation and field sanitation.
- Strict plant quarantine regulations should be enforced to avoid the spread of rust on pods or seeds to disease free areas.
- Early sowing in the first fortnight of June to avoid disease incidence.
- Intercropping pearl millet or sorghum with groundnut (1 :3) is useful in reducing the intensity of rust.
- Use resistant/tolerant varieties.



Mechanical Control

Destroy volunteer (self sown) groundnut plants and crop debris to reduce / limit primary source of inoculum.

Biological Control

Foliar application of aqueous neem leaf extract @ 2-5% is useful and economical for the control of rust.