

## **New Technologies Developed for Inclusion in Package of Practices**

### **Crop Improvement (5)**

#### **Plant Biotechnology (1)**

- a) **Application of minimally aerated Compost tea (Compost Kashaya) for increased yield in groundnut crop:** The application of minimally aerated compost tea (compost Kashaya) has been developed as an integrated technology for increasing pod yield (25-30%) in groundnut. Aerated compost tea is prepared by continuously aerating the compost – water suspension using anaerator for a period of four days. However, we have developed a simpler method of preparing compost tea. In this modified method, the suspension of compost and water is mixed once a day using a stick, resulting in minimal aeration during the preparation. Application of minimally aerated Compost tea improves the plant biomass, chlorophyll content and induces defense priming in plants. The application of compost tea enhances the pods per plant, 100 seed weight and the shelling percent in groundnut crop. The technology is farmer friendly, economical (B/C ratio of 1: 13) and eco friendly and reduces the application of fungicide by 50%.

#### **Seed Science and technology (4)**

- a) Rice hybrid KRH-4 and varieties *viz.*,Gangavathi sona, Thanu, MAS-26 and MAS-946-1 are also suitable for cultivation under direct seeded rice (DSR) method.
- b) Validation of suitable pre-sowing seed treatment to improve plant establishment in dry direct seeded rice method: Seeds are to be soaked in either ZnSo<sub>4</sub> @ 3 % or CaCl<sub>2</sub> @ 2 % for 16 hours and shade dried before sowing to get higher field emergence, optimum plant population and higher grain yield.
- c) Proso millet seeds primed with 20 % liquid *Pseudomonas fluoresces*(adopting 1:1 seed solution ratio) for 6 hrs and dry for 8 hours under shade before sowing.
- d) Soybean seeds packed in a super grain bag along with Zeolite beads in the ratio of 1Kg seed to 100 g Zeolite beads would extend the storability up to 18 months by maintaining all the seed quality parameters.

### **Crop production (8)**

#### **Agronomy (3)**

- a) **Recasting of Chapter-12: Crop production systems in different zones (*Vividha Krishi Valayagalalli Bele Utpaadana Vyavasthe: Zone-4, 5 & 6*):** Concepts on Rain star wise rainfall quantity, Optimum sowing windows for pre-monsoon season, Crops and

agricultural activities for pre- monsoon season based on long term rainfall analysis (30 and 50 Years) and Agro-climatic onset of sowing date were included by modifying the present monthly rainfall details, cropping pattern and sowing window.

**b) Suitable planting geometry and intercrops in top feeds for higher green forage yield & quality:**

- ✓ Cultivation of top feeds like Sesbania, Erythrina and Drum stick with a row spacing of 6 ft. and 1.5 ft. from plant to plant recorded additional green forage (67.1 q/ha), dry matter (16.7 q/ha) and crude protein yield (2.9 q/ha) with additional net returns (Rs. 14,000/ha).
- ✓ Cultivation of 2 rows B x N hybrid with a row spacing of 3 feet & 2 feet from plant to plant in between rows of top feeds recorded additional green forage yield (429.6 q/ha), dry matter (77.5 q/ha) & crude protein (7.96 q/ha) yield with additional net returns (Rs. 52,100 /ha).

**c) Chapter on Rice Bean crop is included in the package of practice with details on variety, season and soil, land preparation, seeds and sowing methods, manures and fertilizers, thinning of seedlings, inter-cultivation & earthing up, weed Control, water management, plant protection, yield and low cost technologies**

**Soil Science & Agril. Chemistry (5)**

**a) Subsoil manuring for enhancing crop productivity in rainfed farming regions of southern Karnataka for both sodic and red soil situations**

- Subsoil manuring in dry land sodic soils / dry land red soils having subsoil hardpan to be taken up immediately after 1<sup>st</sup> showers during May – June with recommended doses of fertilizers and double dose of organic manure (poultry manure or press mud or sheep manure) through sub soil ripper having manuring tank attached to tractor at 1 meter apart and at 45-50 cm depth. After getting good rains during monsoon season, crops can be grown.
- In the similar way next year also in the same field recommended dose of NPK for the crop to be grown along with double dose of organic manure should be applied through subsoil ripper at 1 meter apart between the earlier 1 meter ripper space to a depth of 45-50 depth. Then, after getting good rains in monsoon the crop decided earlier to be grown, so that the soil sodicity / subsoil hardpan will be reduced, due to breaking of subsoil hardpan and adding organic manures, thereby water and nutrient holding capacity will be enhanced. Because of this, soil fertility will be improved and can grow good crops in these soils in the coming years.

- b) Utilization of slag based gypsum in groundnut cultivation:** Application of RDF + 625 kg slag based gypsum/ha as 50% at the time of sowing + 50% at 30 days after sowing recorded higher pod, haulm, oil and protein yield of groundnut. There was increase in pod, haulm, oil and protein yield of groundnut by 11.40, 19.06, 18.96 and 14.38 %, respectively with the application of 625 kg SBG/ha (50 % at sowing + 50 % at 30 DAS) over package of practice (POP: RDF + 500 kg commercial gypsum/ha at 30 DAS). Higher benefit cost ratio (3:1) was noticed in the treatment which received RDF + 625 kg slag based gypsum/ha as 50% at the time of sowing + 50% at 30 DAS when compared with POP (2.70:1) applied treatments.
- c) Composting of sericulture wastes using compost culture and waste decomposer:** Composting of sericulture waste using compost culture developed by University of Agricultural Sciences, Bengaluru or waste decomposer developed by National Centre of Organic Farming (NCOF), Ghaziabad results in speed up the decomposition process and obtain high nutrient compost ( 1.5-1.9 % N, 0.5-0.9 % P, 1.5-2.0 % K) within 80-90 days.
- Composting using Compost Culture: One ton of sericulture rearing wastes collected in a constructed pit or compost bag spreading mulberry twigs at the base layer followed by waste from rearing house is then spread over. For each layer of residue spread the part of slurry prepared using 1 kg of compost culture with 3 kgs of cowdung, 2litres of cow urine and water. All the above steps are repeated in the stated sequence until the pit is filled with 1-2 feet above the pit height. Finally, the pit is plastered with mud and cow dung slurry to maintain optimum moisture content inside the heap. To avoid rain, wind, and to maintain the moisture and temperature, the pit should be covered with grass or coconut fronds or polythene sheet. Water is sprayed time to time over the pit to attain 60-70 % moisture. After 3-4 weeks of decomposition, the first turning is done. Compost will be ready by 80-90 days.
  - Composting using waste decomposer: Mix 2kgs of jaggery and one bottle of waste decomposer containing 10g microbial consortium into 200 litres of water in a plastic drum. Stir the content of the drum with a wooden stick every day twice, cover it and place under shade. On 6<sup>th</sup> day, sprinkle 40litres of waste decomposer solution from 200litres to every layer of one ton sericulture rearing wastes filled in a compost pit or compost bag. From rest of 160 litres of waste decomposer solution, sprinkle 40 litres every day to compost pit within 4 days. Water is sprayed time to time over the pit to

attain 60-70 % moisture. After 3-4 weeks of decomposition, the first turning is done. The compost will be ready by 80-85 days.

**d) Effect of Multimicronutrients mixture application on growth and yield of aerobic**

**Paddy:** Application of soil grade micronutrients mixture (Fe+Mn+Zn+B) @ 5 kg per acre at the time of transplanting and spraying of foliar grade micronutrients mixture (Fe+Mn+Zn+B) @ 1.00 per cent at 20 and 40 days after transplanting recorded higher grain yield of 31.5 q/ acre with B:C ratio of 1.6:1 in aerobic paddy.

**e) Effect of Multimicronutrients mixture application on growth and yield of Irrigated**

**Paddy:** Application of soil grade micronutrients mixture (Mn+Zn+B+Mo) @12 kg per acre at the time of transplanting and spraying of foliar grade micronutrients mixture (Mn+Zn+B+Mo) @ 0.20 per cent at 30 and 45 days after transplanting to aerobic paddy enhances grain yield by 8.80 per cent with B:Cratio of 1.80:1.

**Crop Protection (10)**

**Entomology (3)**

a) **Management of fall armyworm (*Spodoptera frugiperda*) in maize:** For management of fall armyworm (*Spodoptera frugiperda*) in maize when infestation is noticed, apply spinetoram 11.7 SC @ 0.5ml or emamectin benzoate 5 SG @ 0.4g or chlorantraniliprole 18.5 SC @ 0.4g or thiodicarb 75 W.P. @ 1g/liter of water to the infested leaf whorl.

Note: Since larvae of fall armyworm feed inside the leaf whorl, spray should be targeted only to leaf whorl.

b) **Pre- harvest management of pulse beetle (*Callosobruchus sp*) in pigeonpea:**Spraying emamectin benzoate 5 SG @ 0.3g/l at pod maturity controls the field infestation of pulse beetle (*Callosobruchus sp*). The seed can be stored upto a month without any treatment.

c) **Management of rodents in paddy:** Place Snap traps @ 50/ha (Continuously 3 nights) at tillering stage and apply 2 per cent Bromadiolone CB (0.25 %) bait in burrows and bunds at Panicle formation stage of the crop.

Note: For preparation of 1.0kg poison bait, add 450g rice, 450g ragi, 50g groundnut kernels, 50g groundnut oil and mix thorouly with 20g of Bromadiolone powder. Prepare paper pockets containing 10g poison bait to be placed in field.

**Plant Pathology (7)**

a)**Management of blast disease in Rice:** Isoprothiolane 40%EC @ 1.5 ml/L was effective in managing the leaf blast disease by recording 65.2% disease reduction and 26.06 % increased yield with cost benefit ratio 1.92. Spraying of isoprothiolane 40%EC @ 1.5 ml/L at 5% panicle

emergence stage was effective against neck blast by recording 80.05% disease reduction and 80.74 % increased yield with benefit cost ratio 1.98:1.

**b) Management of blast disease in finger millet:** Seed treatment with chitosan 2g/kg of seed followed by spraying of *Pseudomonas fluorescens* + *Trichoderma viride* talc each 5g per litre of water at and grain filling stage for the management of blast disease in finger millet

**c) Management of Alternaria leaf spot disease in cotton:** Foliar spray with Pyraclostrobin 20% WG @ 500 grams/ha has reduced the disease incidence of 64.1 per cent and increased the yield of 187 per cent over the untreated control and recorded the B:C ratio of 2.56:1. Hence Pyraclostrobin 20% WG @ 500 grams/ha is recommended to manage the Alternaria leaf spot disease in cotton.

**d) Management of yellow mosaic virus in ridge gourd through integrated approach**

Cultivation practices	Chemical/product	Quantity/dosage
Before sowing	Intercropping with two rows of border crops of maize 30 days before sowing	1 kg
	Soil application of <i>Pseudomonas fluorescens</i> along with neem cake	(1 kg <i>Pseudomonas fluorescens</i> 100 kg neem cake)
Sowing time	Seed treatment with Thiomethaxam 25 WS – 5g/kg seeds, Mulching with black silver mulch	5g/kg seeds
20 Days After Sowing (DAS)	Spraying of seaweed extract Installation of yellow sticky traps	1.5 ml/litre of water 10 no/acre
30 DAS	Thiamethoxam 25% WG	0.3 g/litre of water
45 DAS	Imidacloprid 17.8 SL	0.5ml/litre of water

**e) Management of Turcicum Leaf blight of maize:** Spraying twice one at 35 & 50 DAS of Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 0.10% should be taken

**f) Management of downy mildew disease in maize:** Seed treatment with Metalaxyl M 31.8 ES @ 2.4 ml/kg of seed and foliar spray with Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @0.1% at 30DAS has reduced the disease incidence of 98.3 per cent and increased the yield up to 4.8 times over the untreated control and recorded the B:C ratio of 1.71:1.

**g) Management of Pigeonpea sterility mosaic disease:** Fenpyroximate 5% E. C. @ 1 ml/L at 25 and 40 days after sowing controlled the disease upto 41% and the increase in yield was 67% compared to the unsprayed control with the B:C ratio of 2.08:1.

### **Sericulture(3)**

- a) **Evaluation of suitable intercrops in tree Mulberry for additional income:** Growing determinant type of cowpea as an intercrop in tree mulberry garden, where the space 10x10 ft or 9x9 ft given from plant to plant and row to row gives additional income and increase the profitability of mulberry cultivation. It also improves the soil fertility of tree mulberry garden.
- b) **Management of mulberry leaf roller:**When the mulberry garden is infested by mulberry leaf roller, *Diaphania pulverulentalis* (Hampson), spray Chlorfenapyr 10% SC 1.5 ml / 1 ltr of water. Use mulberry leaves for silkworm rearing only 20 days after the spray of insecticide.
- c) **Management of Mites in Mulberry:**Spray propargite 57EC @ 1.5 ml per litre of water by drenching all the apical leaves of mulberry plant. If the infestation is severe, repeat the same spray at an interval of seven days from first spray. However, the mulberry leaves sprayed with propargite 57 EC @ 1.5 ml litre of water are safe to silkworm after 16 days of last spray.

### **Apiculture(1)**

- a) **Separate chapter on “double queen system for management of *Apis cerana*”:**Adoption of double queen system for management of *Apis cerana* would minimise absconding and enhance foraging activity with higher honey yield and fastens growth and development of colony. This technology is also helpful in colony multiplication.
  - ✓ Brood area was higher in DQS (274.65 inch<sup>2</sup>) as compared to that of 166.97 inch<sup>2</sup> in control.
  - ✓ Honey area was higher in DQS (217.73 inch<sup>2</sup>) as compared to that of 154.15inch<sup>2</sup> in control.
  - ✓ Pollen area was higher in DQS (36.13inch<sup>2</sup>) as compared to that of 21.67inch<sup>2</sup> in control.

### **Agriculture Engineering (1)**

- a)**Tractor drawn automatic seed-cum-fertilizer drill for intercropping /monocropping system of multi-crops:** Monocropping/ intercropping system of multi-crops improved

tractor drawn seed-cum-fertilizer drill developed by the scientist of Dryland Agriculture Project, University of Agricultural Sciences, GKVK, Bangalore. Monocrops like finger millet, pigeon pea, groundnut, soyabean, field bean, horse gram, cowpea, kodo millet, foxtail millet, bajra, jowar, maize etc., seeds could be sown by this improved seed drill. Inter cropping system such as 10 rows of groundnut with 2 rows of pigeon pea (10:2) and 10 rows of finger millet with 2 rows of pigeon pea (10:2) can be taken up by this improved seed drill. This seed drill also found suitable to take up strip cropping like finger millet 21 rows and 21 rows field bean/cowpea/horse gram. This method of sowing helps to take up harvesting by using combined harvester. Strip cropping system having runoff permitting and runoff resistant crop helps to conserve more moisture. This improved seed drill can be driven by 35 to 50hp tractor. The cost of improved seed drill is Rs.95,000/-