

JUNAGADH AGRICULTURAL UNIVERSITY
RESEARCH RECOMMENDATIONS FOR SCIENTIFIC COMMUNITY

III. PLANT PROTECTION

Total 69 scientific recommendations developed by plant protection disciplines are described below.

Year: 2004-05

Entomology

1. Castor

The castor genotypes having the plant characters of double bloom and triple bloom were found resistant against jassid and they gave the lowest jassid population and higher seed yield than the genotypes having the plant characters of no bloom and single bloom. Whereas, the castor genotypes having the plant characters of no bloom and single bloom were found resistant against whitefly and thrips and they gave the lowest pest population than the genotypes having the plant characters of double bloom and triple bloom. So, these genotypes are recommended to be utilized in breeding programme for pest resistance.

(Main Oilseeds Research Station, JAU, Junagadh)

2. Forage Sorghum

In forage sorghum, plant damage by shoot fly was in the range of 3.3 per cent at 28 DAG (Days After Germination) to 5.0 per cent at 21 DAG. Whereas, due to stem borer plant damage was 12.90 per cent at 48 DAG, leaf damage score was 2.7 at 44 DAG and stem tunneling was 8.3 per cent at harvest time.

(Grassland Research Station, JAU, Dhari)

Year: 2005-06

Entomology

3. Sesame

Avoidable yield loss in sesame due to infestation of leaf roller (*Antigastra catalaunalis*) ranged between 8 to 34 per cent with an average of 16 per cent.

(Main Dry farming Research Station, JAU, Targhadia)

4. Sesame

Yield loss in sesame (G. Til-2) due to pest complex i.e. leaf webber (*Antigastra catalaunalis*), gall fly (*Asphondylia sesami*), mite (*Polyphagotarsonemus latus*) and leaf eating beetle (*Pucneforus impressus*) was 38.70 per cent.

5. Sesame

Sesame genotypes/varieties, G.Til-10 and NG-2-177 were tolerant to leaf webber/capsule borer (*Antigastra catalaunalis*). Entries G.Til-10, NG-2-177, AT-103 and AT-93 were tolerant to gall fly (*Asphondylia sesami*). Entry AT-93 was tolerant to mite (*Polyphagotarsonemus latus*).

(Agricultural Research Station, JAU, Amreli)

6. Cabbage & Cauliflower

The population of aphid (*Brevicoryne brassicae*) and whitefly (*Bemisia tabaci*) in cabbage and cauliflower were maximum during early January to early February under Junagadh condition. The diamond back moth (*Plutella xylostella*) infestation initiated in early January and reached at peak in early February. The population of aphid and whitefly were negatively correlated with maximum temperature in cabbage, while the DBM population in both the crops was positively correlated with wind speed.

(Department of Entomology, CoA, JAU, Junagadh)

Plant Pathology

7. Chickpea

The crop rotation of chickpea after sorghum OR chickpea after bajra and apply castor cake in furrow @ 500 kg/ha at the time of sowing with seed treatment of carbendazim 1 g + thiram 2 g/kg seed OR castor cake in furrow @ 500 kg/ha at the time of sowing with seed treatment of tebuconazole 3 g/kg seed gave the effective management of wilt in irrigated *rabi* chickpea under South Saurashtra Agro-climatic Zone.

(Pulses Research Station, JAU, Junagadh)

Year: 2006-07

Plant Pathology

8. Cotton

Seed treatment @ 10 g/kg seed + soil application @ 2.5 kg/ha at the time of sowing with *Pseudomonas fluorescens* strain Pf 1 or *Pseudomonas fluorescens* strain Pf 2- CHAO strain was found effective for management of bacterial blight of cotton and seed treatment @ 10 g/kg seed + foliar spray @ 0.2% of the above strain at 30, 60 and 90 days after sowing significantly reduced the bacterial leaf blight of cotton variety G.Cot.Hy-10.

(Cotton Research Station, JAU, Junagadh)

9. Ber

The intensity of powdery mildew (*Oidium erysiphoides*) of ber increased with the decrease in maximum temperature below 35 °C, minimum temperature below 20 °C and morning relative humidity.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2007-08

Entomology

10. Pearl Millet

In pearl millet, incidence of shoot fly *Atherigona approximate* (Malloch) started at seedling stage and remained up to earhead stage. It was non-significantly and positively correlated with maximum and minimum temperatures and the difference of temperature, while negatively with remaining parameters. Incidence of stem borer *Chilo partellus* (Swinhoe) started from early crop stage. Comparatively higher dead heart per cent was noticed at pre flowering and earhead stages. Maximum temperature and the difference of temperature exhibited significantly negative correlation with stem borer incidence, while remaining weather parameters showed significant positive correlation. Incidence of *Helicoverpa armigera* (Hub.) (Earhead worm) started at earhead emergence was higher at 63 days after germination (DAG) and decreased towards maturity. Its correlation was found significantly positive with minimum temperature and negative with rainy days.

(Main Pearl millet Research Station, JAU, Jamnagar)

11. Groundnut

The coccinellid *Menochilus sexmaculatus* (F.) was the major predator of aphid, *Aphis craccivora* Koch on groundnut crop. The predator commenced one week later than the aphid (Prey) which multiplied very fast and reached at peak in 31st standard week. There was highly significant and positive correlation between population of the predator and the aphid on groundnut crop. The pest to predator ratio was 33:1 (aphid/twig: coccinellid/plant).

(Main Dry Farming Research Station, JAU, Targhadia)

Plant Pathology

12. Groundnut

Pseudomonas fluorescens Pf-1 (ICBR 1:23.34) and *Trichoderma viride* - Local (ICBR 1:26.28) as seed treatment @ 10 g/kg seed are highly effective and economical in reducing collar rot, stem rot and tikka diseases of groundnut.

(Main Oilseed Research Station, JAU, Junagadh)

Year: 2011-12

Entomology

13. Testing bio efficacy of insecticides through seed treatment against sucking pests of summer groundnut

Seed treatment with imidacloprid 600 FS @ 2 ml/kg seed gave effective control of jassids and thrips in summer groundnut up to 35 day after sowing.

(Main Oilseed Research Station, JAU, Junagadh)

14. Monitoring of fruit flies in mango orchard through methyl eugenol trap

In mango orchards of South Saurashtra Agro-climatic Zone, the population of fruit fly (*Bactocera dorsalis* Hendel) males was maximum during April to September (14th to 36th Met. Standard week). Its activity was related positively with high humidity (80 to 90 %) and 24 to 26 °C minimum temperature.

(Department of Entomology, CoA, JAU, Junagadh)

15. Monitoring of fruit flies in mango orchard through methyl eugenol trap

In mango orchards of North Saurashtra Agro-climatic Zone, the population of fruit fly (*Bactocera dorsalis* Hendel) males was maximum during 1st week of April to last week of July (13th to 31th Met. Standard week). Its activity was related positively with maximum (32 to 42 °C) and minimum (21 to 27 °C) temperature and relative humidity (63 to 89 %).



16. Monitoring of pod borer by pheromone trap in chickpea

The population of gram pod borer (*Helicoverpa armigera* Hub.) males was observed throughout the crop period except severe winter month, with maximum activity in 3rd Met. Standard week. Its activity was related negatively with maximum and minimum temperature and mean evaporation.

17. Population dynamics of shoot fly and stem borer in forage sorghum in relation to abiotic factors

The sorghum shoot fly (*Atherigona soccata*) and stem borer (*Chilo partellus*) in *kharif* forage sorghum were active during 14 to 21 DAG and 45 DAG, respectively. Weather parameters did not show any effect on damage caused by both the pests; however, afternoon relative humidity caused negative effect on the damage caused by shoot fly.

(Grassland Research Station, JAU, Dhari)

Year: 2012-13

Entomology

18. Evaluation of different chickpea varieties to bruchid (*Challosobruchus chinensis* L.) damage in storage

Varieties of chickpea *viz.*, Chaffa, ICCL 86111, GG 4 and Dahod Yellow were found comparatively less susceptible and Phule G 0517 and PKV 4 as more susceptible to bruchid in stored chickpea. White colour, smooth surface, large and very large seeded varieties (>22 g/100 seed weight) of chickpea were found more preferred for oviposition to bruchid, whereas white colour, large and very large seeded varieties (>22 g/100 seed weight) were found more preferred for development. Numbers of eggs and adult emergence have significant positive correlation with 100 seed weight and seed damage.

(Pulses Research Station, JAU, Junagadh)

Year: 2014-15

Entomology

19. Management of sucking pests through insecticides in brinjal

Three sprays of bifenthrin 10 EC, 0.02 %, 20 ml /10 litre water or buprofezin 25 SC, 0.06 %, 24 ml/10 litre of water at 15 days interval starting from the pest infestation found effective for the control of brinjal whitefly.

The PHI for bifenthrin 10 EC, 0.02 % and buprofezin 25 SC, 0.06 % is 1 and 7 days, respectively.

20. Population dynamics of important pests of mango

The incidence of mango hopper, thrips and flower bug was found high during December to February while, leaf gall midge and shoot borer were found active during September to October.

21. Population dynamics of important pests of pomegranate

Anar butterfly was found high during November to May while, thrips was found active during August to November in pomegranate.

(Department of Entomology, CoA, JAU, Junagadh)

22. Testing of efficacy of different newer insecticides against shoot fly and stem borer in pearl millet

Seed treatment with imidacloprid 600 FS @ 8.75 ml/kg, 4.20 g a.i./kg at the time of sowing followed by spray with spinosad 45 SC, 0.009 % @ 2.0 ml/10 litre at 35 days after germination of the crop found effective for the management of shoot fly and stem borer. The PHI for these insecticides is 42 days.

(Pearl millet Research Station, JAU, Jamnagar)

23. Incidence of insect pests of chickpea through the cropping period and monitoring of pod borer moths using pheromone traps

Normal and late sowing of chickpea varieties showed sustainable population of *Helicoverpa armigera* at 60 days after sowing.

(Pulses Research Station, JAU, Junagadh)

Plant Pathology

24. Effect of fungicides application in cumin on *Trichoderma* applied in soil

Soil drenching of carbendazim 50 WP @ 2 kg in 2000 litre water/ha or foliar spray of mancozeb 75 WP @ 30 g/10 litre or hexaconazole 5 EC @ 10 ml/ 10 litre against soil borne diseases do not reduce the population of *Trichoderma harzianum* applied in soil.

25. Effect of foliar application of insecticides in cumin on *Trichoderma* applied in soil

Foliar spray of imidacloprid 17.8 SL @ 3 ml/10 litre or dimethoate 30 EC @ 10 ml/10 litre in cumin against sucking pests do not reduces the population of *Trichoderma harzianum* applied in soil.

26. Effect of foliar application of herbicides in cumin on *Trichoderma* applied in soil

Herbicides used as pre-emergence or early post emergence in cumin viz., pendimethalin 30 EC, 0.9 kg a.i./ha, 60 ml/10 litre at 2 DAS or glyphosate 41 SL, 0.75 kg a.i./ha, 37 ml/10 litre at 2 DAS reduces the soil population of *Trichoderma* up to one month after sowing but *Trichoderma* population was increased at later stage. While application of oxyfluorfen 23.5 EC, 0.240 kg a.i./ha, 20 ml/10 litre at 2 DAS do not reduce the population of *Trichoderma harzianum* applied in soil.

(Department of Plant Pathology, CoA, JAU, Junagadh)

27. Disease management through organic practices for organic groundnut cultivation

Blanket furrow application of FYM @ 7.5 tonne/ha followed by *Trichoderma viride* as seed treatment @ 10 g/kg seed, and *T. viride* @ 4.0 kg enriched in 250 kg FYM and as spray @ 2.5 kg/ha (5 g/litre of water) at 30 and 45 DAS found effective for the management of diseases of groundnut.

(Main Oilseed Research Station, JAU, Junagadh)

Year: 2015-16

Entomology

28. Field efficacy of newer insecticides against sucking pests of cumin

Spray of imidacloprid 17.8 SL 0.004 % (2.24 ml/10 lit water) or spinosad 45 % SC 0.009 % (2.0 ml/10 lit water) or acetamiprid 20 % SP 0.004% (2.0 g/10 l water) at the appearance of pests was found effective and economical for control of aphids and thrips in cumin.

Residue was not detected in cumin at harvest of imidacloprid 17.8 SL 0.004 % or spinosad 45 % SC 0.009 % or acetamiprid 20 % SP 0.004%.

29. Management of sucking pests through seed treatments in cluster bean

Seed treatment with imidacloprid 600 FS @ 10 ml/kg seed or thiamethoxam 30 FS @ 10 ml/kg seed found effective and economical for control of whitefly of cluster bean var. Pusa Navbahar.

30. Field efficacy of newer insecticides against inflorescence pests of mango

For effective management of inflorescence pests of mango viz., hopper, thrips and flower bug, two sprays of spinosad 45 % SC 0.018 % (4 ml/10 lit water) or carbosulfan 25 % EC 0.05 % (20 ml/10 lit water) or acetamiprid 20 % SP 0.01 % (5 g/10 lit water) at 15 days interval starting from pests infestation were found effective.

31. Survey of various pests in mango orchard

The incidence of leaf gall midge, mango hopper, shoot borer and thrips were found enormously during the month of September to October, January to March, July to September and August to December, respectively.

Maximum population of leaf gall midge and mango hopper was noticed in Chalala and Mendarda area, while shoot borer and thrips were found maximum in Talala area of Saurashtra region.

(Department of Entomology, CoA, JAU, Junagadh)

Plant Pathology

32. Management of alternaria leaf blight of groundnut

Three sprays of difenconazole 25 EC 0.025 % (10 ml/10 lit of water) at 35, 50 and 65 days after sowing was found effective and economical for management of alternaria leaf blight of groundnut grown in summer season.

(Main Oilseeds Research Station, JAU, Junagadh)

33. Integrated management for wilt disease of chickpea

Seed treatment of *Trichoderma harzianum* 1 % WP @ 4 g/ kg of seed or carboxin 37.5 + thiram 37.5 DS (Ready mix Vitavex powder) @ 2 g/kg seed along with soil application of *T. harzianum* 1% WP @ 4.0 kg/ha at the time of sowing in furrow was found effective against chickpea wilt under irrigated condition.



(Pulses Research Station, JAU, Junagadh)

34. Management of foliar and fruit spot diseases in bottle gourd

Four sprays of difenconazole 25 EC 0.025 % (10 ml/10 lit of water) or hexaconazole 5 EC 0.005 % (10 ml/10 lit of water) at 10 days interval after appearance of the disease was found effective and economical for management of foliar and fruit spot diseases of bottle gourd grown in *kharif* season.

(Vegetable Research Station, JAU, Junagadh)

Year: 2016-17

Entomology

35. Field efficacy of different insecticides against citrus pests

Two sprays of spinosad 45 SC 0.0135 % (3 ml/10 lit. water) and difenthiuron 50 WP 0.05 % (10 ml/10 lit. water) at 15 days interval starting from pests infestation was found effective for management of leaf miner and black fly in South Saurashtra Agro-climatic Zone.

36. Survey of various insect-pests of pomegranate in Saurashtra region

The incidence of anar butterfly and thrips were found enormous during the month of January to April and September to December, respectively. The maximum population of anar butterfly was noticed in Junagadh region, while thrips was found maximum in Kalawad area.



37. Bioefficacy of different insecticides against castor shoot and capsule borer

Two sprays of spinosad 45 SC 0.009 % (2 ml/10 lit. water) or chlorantraniliprole 18.5 SC 0.006 % (3.2 ml/10 lit. water) at 15 days interval starting from pest infestation found effective and economical for the management of castor shoot and capsule borer.

(Department of Entomology, CoA, JAU, Junagadh)

38. Evaluation of some newer insecticides against the leaf weber, *Antigastra catalaunalis* (Duponchal) infesting sesame under rainfed condition

Two sprays of insecticides i.e. indoxacarb 14.5 SC 0.007 % (4 ml/10 lit. water) or spinosad 45 SC 0.009 % (2 ml/ 10 lit. water) or emamectin benzoate 5 SG 0.002 % (4 g/10 lit water) or profenophos 50 EC 0.005 % (10 ml/ 10 lit. water) or chlorantraniliprole 20 EC 0.006 % (3 ml/ 10 lit water) (first at ETL of the pest 5 larvae/ 20 plant and second at 15 days after first spray) found effective for management of sesame leaf weber in North Saurashtra Agro-climatic Zone. There was no problem of residue of all the insecticides in sesame seeds at 30 days after second (last) spray application.



39. Initiation and development of aphid and jassid in relation to different weather parameters on groundnut crop under rainfed condition

The incidence of thrips on groundnut was commenced in 26th SW (Stander Week) and reached to a peak in 33rd SW. The influence of wind speed was found significant on thrips population, while,

other abiotic factors have no significant effect. All the abiotic factors had non-significant effect on aphid and jassid population in groundnut.

(Main Dry Farming Research Station, JAU, Targhadia)

40. Testing of insecticides against major pests of sesame

Two sprays of lambda cyhalothrin 5 EC 0.005 % (10 ml/10 lit. water) or emamectin benzoate 5 SG 0.0035 % (7 g/10 lit. water) (1st spray at ETL of 0.25 larva/plant and 2nd spray at 15 days after 1st spray) found effective and economic for management of leaf weber of sesame in *kharif* in North Saurashtra Agro-climatic Zone.

Two sprays of dicofol 18.5 EC 0.037 % (20 ml /10 lit. water), 1st spray at appearance of mite and 2nd spray at 15 days after 1st spray found effective and economical. Residues of above pesticides in sesame seed were not detected at 30 days after 2nd spray.

(Agricultural Research Station, JAU, Amreli)

41. Evaluation of botanicals, bio-pesticides and insecticides against gram pod borer

Two spray of profenofos 50 EC 0.13 % (26 ml/10 lit. water) and chlorantraniliprole 18.5 SC 0.004 % (2 ml/10 lit. water) were found effective and economic management of pod borer (*Helicoverpa armigera*) in chickpea crop. First spray should be started at 50 % flowering and second at 15 days after first spray. The PHI for chlorantraniliprole 18.5 SC and profenofos 50 EC are 11 and 27 days, respectively.

(Pulses Research Station, JAU, Junagadh)

Plant Pathology

42. Wilt disease development in popular cultivars as influenced by different dates of sowing under changing climate in chickpea

The popular chickpea cultivars viz. JG 16, GG 1, GJG 3 and GG 5 exhibited low wilt incidence and high grain yield as compared to JG 62 (susceptible cultivar). The lowest wilt incidence was recorded in JG 16. In case of date of sowing, no significant differences in wilt incidence and grain yield were found. The low wilt incidence was recorded in normal date of sowing (5th November). Therefore; it was determined that popular cultivars possessed resistance against wilt disease till today.

(Pulses Research Station, JAU, Junagadh)

Year: 2017-18

Entomology

43. Bio-efficacy of different bio-pesticides and insecticides against pink bollworm in Bt cotton (Bollgard-II)

For effective and economical management of pink bollworm, five spray of spinosad 45 SC 0.014 % (3.0 ml/10 litre of water) or chlorantraniliprole 18.5 SC 0.006 % (3.0 ml/10 litre of water), first spray at 5 % appearance of rosette flower and subsequent four spray at 10 days interval after first spray found effective in cotton.

44. Management of *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius) in groundnut through insecticides

For effective and economical management of *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius), three spray of indoxacarb 14.5 SC 0.007 % (5.0 ml/10 litre of water) or spinosad 45 SC 0.014 % (3.0 ml/10 litre of water) or chlorantraniliprole 18.5 SC 0.006 % (3.0 ml/10 litre of water), first spray at the initiation of pest infestation and subsequent sprays at 15 days interval after first spray found effective in *kharif* groundnut.

45. Efficacy of newer insecticides against diamond back moth infesting cauliflower

In South Saurashtra Agro-climatic Zone growing cauliflower in *rabi* season are advised to apply two spray of chlorantraniliprole 18.5 SC 0.006 % (3.2 ml/10 litre of water) at 15 days interval starting from pest infestation for effective and economical management of diamond back moth.



(Department of Entomology, CoA, JAU, Junagadh)

46. Management of ear head worm, *Helicoverpa armigera* (Hub.) infesting bajra crop with bio-pesticides

Spray of DDVP 76 EC @ 0.05 % was found effective and economical for the management of ear head worm, *Helicoverpa armigera* (Hub) in pearl millet at ear head stage.

(Main Pearl Millet Research Station, JAU, Jamnagar)

47. Testing bio-efficacy of insecticides against leaf webber *Crocidolomia binotalis* Zell) of mustard

The scientific community is informed to apply two spray of ready mixture of profenophos 40 % + cypermethrin 4 %, 44 EC 0.044 % 220 g a.i./ha (10 ml/10 litre of water) or profenophos 50 EC 0.05 % 250 g a.i./ha (10 ml/10 litre of water) or novaluron 10 EC 0.005 % 25 g a.i./ha (5 ml/10 litre of water) at 7 days interval starting from pest infestation for effective and economical management of mustard leaf webber.

(Main Oilseeds Research Station, JAU, Junagadh)

48. Response of coconut varieties in relation to different seasons for the eriophyid mite damage

The coconut eriophyid mite damage was higher in summer where as it was lower in winter. Higher damage was recorded in dwarf green variety and less damage in west coast tall (WCT), In hybrid variety, higher damage found in D x T as compared to T x D.

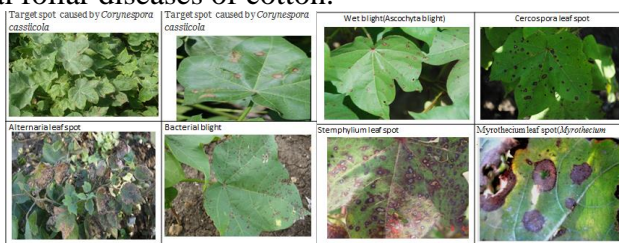


(Agricultural Research Station (Fruit Crops), JAU, Mahuva)

Plant Pathology

49. Management of fungal foliar diseases of cotton

Three spray of mancozeb 63 WP + carbendazim 12 WP, 0.15 % (20g / 10 litre of water) first at initiation of disease and subsequent sprays at 15 days interval was found effective and economical for management of fungal foliar diseases of cotton.



50. Developing IDM modules for the management of cotton diseases

Apply the following Integrated Disease Management Module (IDM) for management of cotton diseases and higher net return.

IDM Module-1:

1. Seed treatment with *Pseudomonas fluorescens* (2×10^8 cfu/g-JAU isolate) @ 10 g/kg seed.
2. Soil application of *Trichoderma harzianum* (2×10^6 cfu/g-JAU isolate) @ 2.5 kg/ha in 250 kg of FYM.
3. Foliar sprays with *Pseudomonas fluorescens* (2×10^8 cfu/g-JAU isolate) 1 % for alternaria leaf spot and copper oxychloride (0.2 %) + streptomycin (0.01 %) for bacterial leaf blight on need basis.



OR

IDM Module- 2:

1. Seed treatment with *Pseudomonas fluorescens* (2×10^8 cfu/g- CICR isolate) @ 10 g/kg seed.
2. Soil application of *Trichoderma viride* (2×10^6 cfu/g-TNAU isolate) @ 2.5 kg / ha in 250 kg

of FYM;

3. Foliar sprays with kresoxim-methyl 44.3 SC @ 1 ml/lit followed by captan 70 % + hexaconazole 5 % @1.5 g/lit for fungal diseases and copper oxychloride (0.3 %) + streptocycline (0.01 %) for bacterial blight.



(Cotton Research Station, JAU, Junagadh)

51. IDM Package for tomato diseases

For effective and economical integrated management of major diseases of tomato viz., damping off, early blight, tomato leaf curl virus and tomato spotted wilt virus disease and to improve the marketable fruit yield following treatments should be adopted.

1. Seeds of tomato should be treated with seed pro @ 4 g per kg seeds at the time of sowing in nursery and after germination of the seeds soil drenching with seed pro @ 5 % should be carried out.
2. Tomato nursery should covered with 40 - 60 mesh white nylon net until transplanting and at the time of transplanting tomato seedling should be dip with 0.1 % (carbendazim 12 % + mancozeb 63 WP) solution.
3. Maize should be grown as border crop surrounding transplanted tomato field. The foliar sprayings of pesticides should be scheduled as acephate 75 WP @ 1.5 g/ litre 10 days after transplanting, fipronil 5 SC @ 1.5 ml / litre 20 DAT, copper hydroxide 77 WP @ 2.0 g / litre 25 DAT and imidacloprid 70 WG @ 2 g / 15 litre 40 DAT along with two to three spraying of Fenamidone 10 % + Mancozeb 50 WDG, 0.25 % from 45 DAT at 10 days intervals.

(Vegetable Research Station, JAU, Junagadh)

52. Studies of weather parameters in relation to initiation and development of stem rot of groundnut

The infection of stem rot in groundnut was commenced in 28th std. week, which developed gradually and reached a peak in 33rd std. week. All the weather parameters viz., minimum temperature, maximum temperature, morning relative humidity, afternoon relative humidity, soil temperature @ 10 cm, rain fall and rainy days were found significantly co-related in building up the disease incidence in groundnut. The influence of all the weather parameters was found 39.10 per cent.

(Main Dry Farming Research Station, JAU, Targhadia)

Year: 2018-19

Entomology

53. Effectiveness of *Beauveria bassiana* in combination of different insecticides against onion thrips

For effective and economical management of thrips, *Thrips tabaci* in onion, three sprays of spinosad 45 SC 0.0135 % (3 ml/10 l of water) OR *Beauveria bassiana* 1.15 WP 0.0035 % (Min. 2 x 10⁶cfu/g) + spinosad 45 SC 0.0068 % (30 g + 1.5 ml/10 l of water), first at initiation of pest infestation and subsequent two sprays at ten days interval found effective in onion.

54. Effect of different schedule base insecticidal spray against garlic thrips

For effective and economical management of thrips, *Thrips tabaci* in garlic, schedule spraying of dimethoate 30 EC 0.003 % (10 ml/10 l of water), fipronil 5 SC 0.01 % (5 ml/10 l of water) and acetamiprid 20 SP 0.006 % (4 g/10 l of water) OR profenophos 50 EC 0.075 % (20 ml/10 l of water), spiromesifen 240 SC 0.011 % (10 ml/10 l of water) and thiamethoxam 25 WG 0.01 % (4 g/10 l of water), first at initiation of pest infestation and subsequent two sprays at ten days interval after first spray.

55. Management of sucking pests in cumin

For effective and economical management of thrips, *Thrips tabaci* in cumin, two sprays of *Beauveria bassiana* 1.15 % WP + dinotefuran 20 % SG 0.005 % (60 g + 2.5 g/10 l of water) OR *B. bassiana* + flonicamide 50 % SG 0.0125 % (60 g + 2.5 g/10 l of water), first at pest infestation and second at ten days interval.

(Department of Entomology, JAU, Junagadh)

56. Screening of sesame genotypes against insect pests and diseases under unprotected as well as protected condition

Sesame genotype AT 382 and variety G.Til 10 found resistant to mite pest whereas G.Til 10 also found resistant to powdery mildew and phytophthora diseases. These cultures can be utilized as multiple resistant source for further breeding programme.



(Agricultural Research Station, JAU, Amreli)

Plant Pathology

57. Management of leaf spot of custard apple

For the effective and economical management of leaf spot of custard apple, apply three spray of tebuconazole 50 % + trifloxystrobin 25 % WG 0.045 % (6 g/10 l of water) OR carbendazim 12 % + mancozeb 63% WP, 0.15 % (20 g/10 l of water) OR azoxystrobin 23 % SC, 0.023 % (10 ml /10 l of water) OR mancozeb 75 % WP 0.2 % (27 g/10 l of water), first at initiation of disease and subsequent sprays at 20 days interval.



(Department of Plant Pathology, JAU, Junagadh)

Year: 2019-20

Entomology

58. Synergism of different plant oils with different insecticides against pod borer, *Helicoverpa armigera* infesting chickpea

Two sprays of flubendamide 48 SC 0.015 % + neem oil 0.5 % (3.20 + 50 ml/10 l of water) along with sticker (3 ml/10 l water), first spray when pest crosses the economic threshold level (0.75 larvae/plant before flowering and 0.5 larvae /plant after flowering) and second, at 20 days after first spray found effective against *Helicoverpa armigera* infesting chickpea.

(Department of Entomology, JAU, Junagadh)

59. Study on efficacy of different insecticides against white fly in papaya

Two sprays of acetamiprid 20 SP 0.006 % (3 g/10 l of water) OR thiamethoxam 25 WG 0.01 % (4 g/10 l of water), first at nymphs and adults infestation and second at 15 days after first spray found effective against whitefly (*Bemisia tabaci*) infesting papaya.

(Department of Horticulture, JAU, Junagadh)

60. Bio-efficacy of new insecticidal molecules against sucking pest of summer groundnut

Two sprays of clothianidin 50 WDG 0.004 % (0.8 g/10 l of water) OR spinosad 45 SC 0.014 % (3.0 ml/10 l of water) OR dinotefuran 20 SG 0.006 % (3.0 g/10 l of water) at 10 days interval starting from pest infestation found effective against thrips in summer groundnut.

61. Bio-efficacy of biopesticides against sucking pest infesting groundnut

Two sprays of spinosad 45 SC 0.018 % (4 ml/10 l of water) at 10 days interval starting from pest infestation found effective against thrips in *kharif* groundnut.

62. Management of white grub in groundnut

Seed treatment with clothianidin 50 WDG 4 g per kg of seed found effective against white grub in *kharif* groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)

63. Phenology based application of selective insecticide/ biopesticide combinations for *Spodoptera exigua* and *Helicoverpa armigera* in chickpea

Spraying of profenophos 50 EC 0.13 % (26 ml/10 l water) followed by emamectin benzoate 5 SG 0.002 % (4 g/10 l water) 15 days after first spray was found effective against pod borer (*Helicoverpa armigera*) infesting chickpea.

(Pulses Research Station, JAU, Junagadh)

64. Testing of IPM modules with farmers practice against pest complex of pearl millet

Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg seeds + removal of shoot fly dead hearts + fish meal trap @ 10/ha at 7 days after germination (fish meal to be replaced once a week) + spraying of novaluron 10 EC 0.01 % (10 ml/10 l water) at 35 DAG recorded lowest stem borer per cent incidence of pearl millet.

65. Testing the efficacy of different insecticides against shoot fly and stem borer in pearl millet

Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seeds followed by spray of fipronil 5 SC 0.01 % (20 ml/10 l water) for shoot fly, while chlorantraniliprole 20 SC 0.006 % (3.0 ml/10 l water) for stem borer at 35 DAG were found effective in pearl millet.

66. Evaluation of pre-harvest spraying of insecticides for management of pulse beetle (*Callosobruchus* sp.) in green gram

Green gram seeds can be protected up to two months from pulse beetle infestation during storage (seed purpose) by giving spray in the field either profenophos 50 EC 0.05 % (10 ml/10 l of water) or emamectin benzoate 5 SG 0.0015 % (3.0 g/10 l of water) at 50 and 100 % pod maturity of green gram.

(Main Pearl millet Research Station, JAU, Jamnagar)

Plant Pathology

67. Development of technologies for the management of soil borne diseases of groundnut

Deep ploughing in summer with mould board plough + furrow application of *Trichoderma harzianum* 1 % WP (2×10^6 cfu/g) @ 4 kg/ha enriched with 250 kg FYM/ha at the time of sowing + seed treatment with tebuconazole 2 DS @ 1.5 g/kg of seeds followed by seed treatment with PGPR (1×10^7 cfu/g) @ 5 ml/kg seeds + line application of *T. harzianum* 1 % WP @ 4 kg/ha enriched with 250 kg FYM/ha at 35 and 70 DAS near the base of plant found effective against collar rot and stem rot diseases in groundnut.

68. Management of major foliar diseases of groundnut

Seed treatment of tebuconazole 2 DS @ 1.5 g/kg seeds with two spray of tebuconazole 50 % + trifloxystrobin 25 % WG @ 0.035 % (13.2 g/10 l of water) at 40 and 65 DAS found effective against foliar diseases (Early Leaf Spot and Late Leaf Spot) in *kharif* groundnut.

69. Evaluation of different IPDM modules for management of major insect-pest and diseases in groundnut

Seed treatment with *Trichoderma harzianum* 1 % WP @ 4 g/kg seed + need based spray of imidacloprid 17.8 SL 0.005 % (3 ml/10 l water) for sucking pest + need based spray of novaluron 10 EC 0.010 % (10 ml/10 l water) for defoliators at 50-70 DAS + two sprays of tebuconazole 25.9 EC 0.0259 % (15 ml/10 l water) at 50 and 70 DAS found effective against early leaf spot and late leaf spot diseases and leaf damage caused by defoliators (*Helicoverpa* & *Spodoptera*) of groundnut.

(Main Oilseeds Research Station, JAU, Junagadh)