Short Communication

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Emerging issues in pest management for food safety and quality of arid horticultural produce

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Pomegranate

Pomegranate high valued fruit crop which was barely few hundred acres in 1960-69 has shot up roughly to 1,93,000 ha with annual production 13.46 lakh ton and productivity of 10.27 ton/ha in 2014-15 in India, which is contributing 70% of the total area from Maharashtra(Anon.,2015).Such important fruit crop is attacked by several insect and non-insect pests as well as diseases. Therefore, it is necessary to adopt integrated pest management in pomegranate. In this context the knowledge of key pest, natural enemies, pollinators , their life cycle and scouting of pest has become important in Integrated pest management .

a. Pests of National Significance:

Insect pests

1. Anar butterfly:*Deudorix Isocrates* Fabricus 2. Stem borer :*Coelosternaspinator*Febricius 3. Shot hole borer: *Xyleborusperforans*Wollastan 4. Whitefly:*Siphorinusphillyreae*Haliday5. Thrips: *Scirtothripsdorsalis*Hood 6. Fruit borers: *Conogethespunctiferalis*, 7. Root knot nematode: *M. incognita*

b. Pests of Regional Significance:

1. Pomegranate aphid : *Aphis punicae*Passerini2. Mealy bugs: *Ferrisiavirgata*Cockerell 3. Mites :*Tenuipaluspunicae* 4. Fruit fly :*Batocera*spp5. Fruit sucking moth: *OtherisfullonicaEudocima*spp6. Scale insect :*Parasaissetianigra*

7. Termites :*Odonotermes* spp.

8. Animal and rodent pests : snails, animals like monkeys, squirrels, Jackals etc

c. Predator, parasite & Parasitoids (Natural enemies)

1. Coccinelids (LBB,)

2.Crysoperla,

3. Egg parasitoid :*Trichogramma*spp.

4.NymphalParasitoid: 1.*Ceranisusmenes 2. Encarsiainaron*

5.Larval Parasitoids: *Tetrastichus* spp., 2.*Telenomus* spp., 3.*Chelonusblackburni, 4.Carcelia* spp., 5.*Campoletis chlorideae, 6.Bracon* spp., 7.Braconid wasp, 8. Tachinid flies

6. Larval/pupal parasitoids: 1.Parasitic wasp, 2.Predatory mites, 3.Predatory birds

D) Population Dynamics of Key pest

i. Aphids (*Aphispunicae* passerine) More incidence occurs during December and February.

ii. Thrips: Maximum population build up is found in mrigbaharand severity in July to August whereas, incidence in ambiabahar was noticed in Feb to March.

iii. Whitefly: More incidence of whitefly occurs during Ambiabahar followed by Hasta baharandmrigbahar. The whitefly, mealy bugs and scale insect are found abundant during Ambiabahar.

iv. Shot Hole borer: Maximum pest intensity found in rainy season because of the congenial condition available for the growth of ambrosia fungus(*Monocrosporusambrosium*) which is food source for the grub of this pest inside tunnels.

vi. Fruit borer: Maximum bulid up of this pest has been reported duringMrigbahar(June October).

vii. Stem borer: Since there is one generation of pest in a yearthe maximum damage is found in between June to April

viii. Fruit sucking moth: The incidence of the FSM is generally maximum August to October and peak period of damage is between 8 to 11 PM in the night.(Figure 1-3)

ix. Root knot nematode, (*M. incognita)*: Maximum activity August to January (and peak activity at 44 MW which was found negatively correlated with maximum and minimum temperature air and soil . (Walunj*et a*l, 2015 and 2017)

Pre management strategies:

- Avoid planting in heavy soil to avoid wilt
- Collection and destruction of infested fruit of previous season.
- To follow recommended plant spacing. Avoid close planting or crowding.
- Avoid Mrigbahar as per availability of irrigation facilities
- Follow the crop rotation & avoid cucurbits cultivation
- Growing/ planting of *Agetus*spp.in between the plants.
- Use of biopesticide, neem based pesticide or 5% Neem seed extract on incidence of pests.
- Follow the resting period of three months.

A. At the time of planting :

T**ermites & White grub** : Apply by dusting over pit & mix the 0.3% Fenvalerate dust . Apply FYM by through mixing *Trichoderma* plus @ 20 g / plant

Aphids/whitefly & Mites: Spray the *B. bassiana*, *Metaryziumanisopolae*@ 5g/lit or need base Dimethoate @1.5 ml/lit water

B. Before bahar initiation: At the resting period

Resting of orchard for 60-70 days after harvest with application of FYM at 25 ton/ha with split application ready mix of {*Trichodermaviridae* and *Pacelimyceuslilacinus*} @ 17 g/plant at the time of bahar and 17 g per plant at 90 days after bahar in ring method .

Planting of *tagetus*species between plants.(Anon.,2016)

Cleaning: Collection and burning of dried/ infested fruits to kill overwintering stages of pests. Spraying of Bactinashak @ 250& 500 ppm with captan 50wp @ 2.0 g/lit as preventative measure for Oily spot on pomegranate.

pplication of recommended dose of N.P.K. (650:250:250) & trace element (Ca,Mg,B,Znso4)

aste application to the stem for controlling short hole borer, stem borer and mealy bugs.(Geru 4 kg + 30 ml chloropyrifos + 50 g copper ox chloride /10lit water)

On monitoring the stem borer incidence by excreta through hole, Use iron hole so as to kill the larvae and make it clean and inject 5 ml fenvalerate plus 2 ml dichlorovos 76WSC @ 5 ml in 1 litre of water from stock solution and plug the hole with sticky soap or mud.

C. After bahar initiation: At the vegetative & fruiting

Need base one or two insecticidal application of Imidacloprid 17.8 SL (0.3 ml/lit) Azadiraction 10000 PPM @ 1.5 /lit & cyantrinilprole 18.5SC(0.3 ml/lit) upto flowering stage for the control of aphids,thrips, mites and mealy bugs (Walunj*et al*., 2015)

Need base one or two insecticidal application of spinosad 2.5 EC (1.0 ml/lit followed by neem based (azadirachtin10000 ppm@ 2.0ml/lit), Two sprays Neem oil, plus karanj oil each @3 ml/lit up to 30-90 days at 50 per cent flowering stage for the control of thrips (Anon.,2018 b.)

Three spraying of bioagent*Beaveriabassiana, verticilliumlecani, & Metaryzaanisopolae* during fruit formatting stage for the control of *Deudorixisocrates* @ 5 g/lit of water at an interval week.

Need base application of Emamectin benzoate @ 0.5g/lit, neem seed kernel extract (NSKE) 5% for the control of fruit borer and other pests.

One spraying of *Beaveriabassiana* @ 6 g/lit & *verticilliumlecani* 2 g/lit at an interval of 7 days for the control of mealy bugs/ white files

Use of yellow sticky cards (flyfix) for the control of white files.

Moth catches during night time (8.00 to 11.00 pm) for the control of fruit sucking moth

Use of cover bags (polypropylene cloth) as barriers to fruit.(Walunj, A.R. 2017)

2. Aonla (*Emblicaofficinalis*Gaertn.):

Among the insect pests, the aonla shoot gall maker, *Betousastylophora* Swinhoe, leaf folder, *Garcillariaacidula* bark eating caterpillar, *Indarbelatetraonis* Moorethrips, anar fruit borer, *Deudorix Isocrates* Fabricius, Curculio spp. and mealy bug have been reported to be of major importance

Anagyrusdacylopii and predators like *cryptolaemusmontrouzieri* Muls
- Use of *Lecaniicilliumlecani*@30-60 g/10 lit for spraying. *(*Ann.,2009)
- Use neem based pesticide or 5% Neem seed extract for spraying.
- Spraying of Buprofexin@ 1.5 ml followed by B.*bassiana6.0 g*followed by Azadirachtin 10,000 ppm 3.0 followed by *V. lecanii @ 6.0 g showed better control of mealy bug on custard apple. (Anon.,2018 a)*

4. FIG

1. Fig stem borer, thrips, Fruitfly and fig mite

Management
- Remove and destruct of affected shoots and fruits
- Spraying of dimehtoate or chlorpyrifos @15 ml/10 lit of water at the time of rainy season @ an interval of 15 days. Or Use neem based pesticide or 5%
- Neem seed extract for spraying. To avoid fruit fly infestation, fruits should be harvested when these are still firm/ unripe.
- Fallen infested fruits should be collected and destroyed
- Insert the Iron spike in larval tunnel to kill the caterpillar.
- Application of DDVP or fenvalerate or quinalphos or Kerosene or petrol @ 5 ml in each larval tunnel through syringe or wash bottle or cotton wool and sealing the holes with mud.
- Thrips can be controlled by spraying with cypermethrin 10 EC @ 1.0 ml/lit
- Use of fruit fly : methyl eugenol traps for monitoring and trapping of fruit flies.
- *Two Sprays of thiodicarb 75 WP @1.5g/lit water is recommended fortnightly interval on onset of monsoon for the control of stem borer (*Ann.,2012)

5. BER

A. Major Pests of National Significance

1. Fruit fly: *Carpomyiavesuviana*Costa 2. Fruit borer: *Meridarchisscyrodes* Meyr. 3. Stone Weevil: *Aubeushimalayanus*Voss

B. Pest of Regional Significance

1. Insect pests

1.Bark eating caterpillar: *Indarbelaquadrinotata*walker 2. Mite, *Eriophyescernus*Mssee3. Leaf eating caterpillar: *Euproctis*spp4. Grey hairy caterpillar: *Thiacidaspostica*Walker

Pest management
- ? Wild varieties should not be allowed to grow near about the ber orchard.
- ? Deep raking of soil underneath trees during summer will help in pupal mortality
- ? Resistant varieties viz. Tidaki and Illaichi as moderately resistant to this pest.(Shewale, B.S.,2002) However, the chandegaon sel-1, Mehurun and chalisgaon were found less susceptible to borer(Papade.,R.E., 2016).
- Collection and destruction of infested fruits should be a regular feature. Similarly, the shed fruits after the harvest should be destroyed.
- Off-season fruits of the various species of ber proved to be an important link in carrying over its population to the main crop-season and hence off-season fruits should not be allowed in or near the ber orchard.
- Deep raking of soil underneath trees during summer.
- Collection and destruction of infested/shed fruits from time to time.
- Monitoring the pest population through different types of traps light or with methyl eugenol (2 ml)+ malathion or DDVP 2 ml + water 1 lit by keeping in jar or (locally made plastic bottle with circular hole) to facilitate the entry of fruit fly.
- Spraying (rotationally) with fenvalerate 0.01%,Deltamethrin0.002%,,Quinalphos 0.05 % and Carbaryl 50 WDP at 0.2 % after fruit set at an interval of 30 days(Shevale and Padule, 1992;).
- First sprays of spinosad 2.5 Sc followed by indoxacarb @ 1.0 ml/lit should be given at 50% flowering and 50% fruit setting for the control of fruit borer and stone weevil. (Ann., 2014)

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