



Integrated Disease and Insect Pest Management (IDIPM) Schedule For Pomegranate Cultivation (September,2023)

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This schedule can be used for getting disease and insect free yield in **any crop** season.

CROP SEASONS

S. No.	Crop Season	Months
1	Ambe Bahar (Autumn Season)	January to August
2	Mrig Bahar (Rainy Season)	May/June to December /January
3	Hasta bahar (Winter Season)	September/October to April/May

Note:

- Only 1 crop season per year should be taken.
 - The crop duration and schedule may change slightly as per local climate.
 - Rest period of 2-3 months and stress period of 1-2 months should be followed for crop health and good production.
- Along with organic fertilizers, use below mentioned bio-formulations for **soil application** to control/prevent wilt and nematode infestation as well as improve plant growth, yield and disease resistance.
 - Aspergillus niger* AN 27 @ 1kg/acre (1 month after first irrigation) + Arbuscular mycorrhizal fungi (AMF) – *Rhizophagus irregularis* (formerly *Glomus intraradices*) @ 1kg/acre (b) *Penicillium pinophilum* @ 3kg/acre (10g/plant).**
 - For best results bio-formulations (except AMF) should be used after incubating separately with well decomposed farmyard manure (FYM) for 10-15 days maintaining good aeration and 60% moisture content in the mixture and periodical stirring (Alternate day) under shade. On the day of field application, add AMF in the enriched FYM and put it around root zone of the plants.
 - In market several bio-formulations of *Azospirillum* sp., *Trichoderma* spp., *Paecilomyces lilacinus* are available; these can be used if quality assurance is there. However, use of too many bio-formulations should be avoided unless their compatibility is known.
 - Beneficial organisms available in market bio-formulations are already in soil so enriching soil with suitable organic fertilizers improves the count of native beneficial microorganisms in the soil that improves plant health, growth and yield.
 - Streptomycin sulphate 90%+ Oxy tetracycline 10% (Streptocycline) should not be used if orchards are free from bacterial blight and are in bacterial blight free areas. When used should be sprayed at recommended doses only. **(Caution: As per GOI orders Streptomycin + tetracycline will be banned from Jan 1, 2024).**

- (vii) 2-bromo, 2-nitropropane-1, 3-diol 95% (Bronopol) controls bacterial as well as some fungal diseases. It is also an immune-modulator. Salicylic acid also helps plant acquire resistance to disease and hence, Bronopol and Salicylic acid can be used in all orchards for disease free fruit production
- (viii) **The spray interval of 7-10 days should be adopted in *Mrig Bahar* and 10-14 days in *Hasta* and *Ambia Bahar* seasons.**

FOLIAR SPRAYS

S.No.	Days	Crop Stage	Agrochemicals
SPRAYS FOR CROP INITIATION			
0	15 days before first irrigation	Defoliation	<ul style="list-style-type: none"> • Spray 1% Bordeaux mixture before defoliation. • Spray Ethephon 39% at 5-7 days <ul style="list-style-type: none"> ➤ 1st spray 0.5ml/L+DAP 5g/L ➤ 2nd Spray 0.5ml/L+DAP 5g/L ➤ 3rdSpray. (if required) 1-1.5 ml/L depending on yellowing of leaves • Stem pasting from ground to 1.5 to 2 feet should be done with Red soil paste or 10% Bordeaux paste. (See preparation given on page 7 and 8)
SPRAYS DURING THE CROP PERIOD			
S.No.	Days after defoliation	Crop Stage	Agrochemical Sprays
1.	0-14	Defoliation (100% leaf fall)	<ul style="list-style-type: none"> • After Defoliation, remove fallen leaves and debris from the orchard and burn or put them into the pit for decomposition outside the orchard. • SPRAY: 0.5% Bordeaux mixture OR Copper oxychloride 50% WP @ 2.5 g/L + 2-bromo, 2-nitropropane-1, 3-diol (Bronopol 95%) @ 0.5 g/L.
2.	15-21 days	First flush of leaves	<ul style="list-style-type: none"> • 1stSpray salicylic acid (SA) formulation @0.3 g/L. • Install yellow/ blue sticky traps @ 10-12 traps/ acre randomly in a zigzag manner and tie traps 15cm above the top canopy of the plants. • Replace the traps when more than 90% trap area is covered with insect pests (30-45 days' interval). • Spray Copper hydroxide 53.8% WP @ 2-2.5 g/L+ Thiamethoxam 25% WG @0.5 g/L

3	22 -50 days	Flower initiation to Flowering 100%	<ul style="list-style-type: none"> • 1stSpray Micronutrient mixture @ 1.5 -2 g/L. • Foliar application of Naphthyl Acetic Acid (NAA) @ 10 ppm OR formulation with NAA 4.5% @ 22.5 ml/100 L water for better flowering and fruit set. <p>Take any of the below mentioned Fungicides and Insecticides sprays in rotation at 7 to 10 days interval depending on crop problems observed</p> <p>(a) Fungicides recommended:</p> <ul style="list-style-type: none"> • Mandipropamid 23.4% SC @ 1 ml/L (Best at flowering before disease appearance) • Copper sulphate 47.15% + Mancozeb 30% WG @ 2.5 g/L • Pyraclostrobin 5% + Metiram 55% WG @ 3 g/L. • 2-Bromo, 2-nitropropane-1, 3-diol (Bronopol 95%) @ 0.5g/L. <p>(b) Insecticides recommended:</p> <p>Spray the below insecticides(take any 2 sprays)</p> <p>(i) At the flower bud / before the flower opening:</p> <ul style="list-style-type: none"> • Thiamethoxam 12.6% + Lambda cyhalothrin9.5% ZC @ 0.75-1.0 ml/L. • Tolfenpyrad 15% EC @ 0.75ml/L. • Flonicamid 50% WG @ 0.75-1.0 ml/L. • Thiamethoxam 25% WG @ 0.5 g/L. • Imidacloprid 17.8% SL@ 0.5 ml/L. <p>(ii) After flower opening</p> <ul style="list-style-type: none"> • Spray Azadirachtin/Neem oil 1% (10000 ppm) @ 3ml + Pongamia oil @ 3ml +0.3ml spreader sticker/L water. • Spinetoram 12% SC @ 1 ml/L + Azadirachtin/Neem oil 1% (10000 ppm) @ 2 ml/L or Pongamia oil @ 2ml/L. • Spinosad 45% SC @ 0.5 ml/L water.
4.	50-70 days	Fruit setting	<ul style="list-style-type: none"> • 2ndSpray of Salicylic acid formulation @ a.i. 0.3g/L. • 2nd Spray of Micronutrient mixture @ 1.5 - 2g/L. • Release of <i>Trichogramma chilonis</i> @ 1 lakh/acre at 10-15 days' intervals. <p>Take any of the below mentioned Fungicides and Insecticides sprays in rotation at 7 to 10</p>

days interval depending on crop problems observed

(a) Fungicides recommended:

- Propineb 70% WP @ 3 g/L.
- Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.5 g/L.
- Pyraclostrobin 5% + Metiram 55% WG @ 3 g/L.
- Copper Oxychloride 45% + Kasugamycin 5% WP @ 2 – 2.5 g/L.
- Copper sulphate 47.15% + Mancozeb 30% WG @ 2.5 g/L.
- 2-Bromo-2-nitropropane-1,3-diol 95% WP @ 0.5 g/L + Fosetyl Al 80%WP @ 2 g/L.

(b) Insecticides recommended:

- Chlorantraniliprole 18.5% SC @ 0.75 ml/L
- Cyantraniliprole 10.26% OD @ 0.7-0.9 ml/L.
- Tolfenpyrad 15% EC @ 0.75ml/L.
- Flonicamid 50% WG @ 0.75-1.0 ml/L.
- Acetamiprid 20% SP @ 0.3g/L.
- Imidacloprid 17.8% SL @ 0.5 ml/L.
- Indoxacarb 14.5% SC @ 1.0 ml/L.

If mealybugs/ green stink bug infestation is observed spray.

- Neem oil 10000 ppm @ 3 ml/L water **OR** Neem Seed Extract 50 g/L + Fish oil Rosin soap (FORS) 0.5ml/L and alternate with
- Thiamethoxam (12.6%) + Lambda-cyhalothrin (9.5%) ZC @ 0.5-0.7 ml/L + Fish Oil Rosin Soap 0.5 ml/L water. **OR**
- Buprofezin 25%SC @ 1-1.5ml/L + Fish Oil Rosin Soap @ 0.5 ml/ L water.

If Spodoptera and or Helicoverpa damage is observed; use following strategies:

- Set up light trap @ 1 trap/ha
- Pheromone traps @ 8-10/ha with Spodolure (Spodoptera)
- Pheromone traps @ 8-10 Numbers/ha with Heli-Lure (Helicoverpa)
- NPV @ 500 LE/ha (Helicoverpa)
- Spray SL-NPV @ 500 LE/ha (Spodoptera)

5	71-100 days	Fruit enlargement stage 1	<ul style="list-style-type: none"> • 3rd Spray of Salicylic acid formulation @ a.i.0.3g/L. • 3rd Spray Micronutrient mixture @ 1.5 -2 g/L. <p>Take any of the below mentioned sprays in rotation at 7 to 10 days interval depending on crop problems observed</p> <p>(a) Fungicides recommended:</p> <ul style="list-style-type: none"> • Spray Bordeaux mixture (0.5%) • Copper Oxychloride 45%+ Kasugamycin 5% WP @ 2 – 2.5 g/L • Captan 50% WP @ 2.5g/L • Fluopyram 17.7% + Tebuconazole 17.7% w/w SC @ 1 ml/L • Metiram 55% + Pyraclostrobin 5% WG@ 2.5-3 g /L • Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.5 g/L • Azoxystrobin23%SC @1 ml/L + Propiconazole 25% EC @1 ml/L <p>(b) Insecticides recommended:</p> <ul style="list-style-type: none"> • Cyantraniliprole 10.26% OD @ 0.7-0.9 ml/L • Chlorantraniliprole 18.5% SC @ 0.75 ml/L • Tolfenpyrad 15% EC @ 0.75 ml/L • Flonicamid 50% WG @ 0.75-1.0 ml/L • Indoxacarb 14.5% SC @ 1.0 ml/L <p>If Mealy Bugs/ Green Stink Bug infestation observed; spray any of the below mentioned sprays in rotation:</p> <ul style="list-style-type: none"> • Thiamethoxam 12.6% + Lambda-cyhalothrin 9.5% ZC @ 0.75-1 ml/L • Buprofezin 25%SC @ 1-1.5 ml/L • Acetamiprid 20% SP@ 0.3 g/L • Imidacloprid 17.8% SL@ 0.5 ml/L
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6	100-150 days	Fruit enlargement Stage 2	<ul style="list-style-type: none"> • 4thSalicylic acid formulation @ a.i.0.3g/L 4thSpray micronutrient mixture @ 1.5 -2 g/L. <p>Take any of the below mentioned sprays in rotation at 7 to 10 days interval depending on crop problems observed</p> <p>(a) Fungicides recommended:</p> <ul style="list-style-type: none"> • Spray Bordeaux mixture @ 0.5% • Copper Oxychloride 45%+ Kasugamycin 5% WP @ 2 – 2.5 g/L • Azoxystrobin 23% SC @ 1 ml/L + Propiconazole 25% EC @ 1 ml/L • Spray 2-Bromo-2-nitropropane-1,3-diol 95% WP @ 0.5 g/L. <p>(b) Insecticides recommended:</p> <ul style="list-style-type: none"> • Spinetoram 12% SC @ 1 ml/L + Azadirachtin/Neem oil 1% (10000 ppm) @ 2 ml/L + 0.3 ml spreader sticker/L of water. • Spinosad 45% SC @ 0.5 ml/L water + Azadirachtin/Neem oil 1% (10000 ppm) @ 2 ml/L + 0.3 ml spreader sticker/L of water. • Spray neem oil 10000ppm@ 3 ml/L water/ Neem seed extract 50g/L+ 0.3 ml spreader sticker/L of water. <p>To Protect Against Fruit Fly Damage</p> <ul style="list-style-type: none"> • Pheromone traps @ 15 McPhail trap or Bucket type trap or water bottle trap per ha with Methyl Eugenol (Bador-Lure). Replace the lure @ 15 days' intervals. • Bag/cover the fruits with white PPNW bags/ cover the orchard with nylon/ mosquito net/ cover the rows/trees with PPNW covers. <p>To Protect Against Fruit-PiercingMoth Damage</p> <ul style="list-style-type: none"> • Bag/cover the fruits with white Poly Propylene Non- Woven (PPNW) bags/ cover the orchard boundary with nylon/ mosquito net/ cover the rows with PPNW covers. • If delay in taking bagging; leave damaged fruits on the plant itself. • Dispose of all fallen and decaying fruits. • Spray neem oil @1 % (10000ppm + Citronella oil 1.0 ml/L water in the evening hours to deter the moth (repeat if rain occurs with in 24 hours of spray).
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7	151-180 days	Fruit enlargement and aril colour development	<p>Take any of the following sprays in rotation only if any problem observed</p> <ul style="list-style-type: none"> • Spray 2-Bromo-2-nitropropane-1,3-diol 95% WP) @ 0.5 g/L. • Copper oxychloride 50% WP @ 2.5 g/L. • Bordeaux mixture @ 0.5%.
8	181-220/230 days	Colour development and Fruit Maturity and Harvest	<p>Take any of the following sprays in rotation only if any problem/adverse weather observed</p> <ul style="list-style-type: none"> • Bordeaux mixture @ 0.5% • Spray neem oil 10000 ppm @ 3 ml/L water / Neem seed extract 50 g/L + 0.3 ml spreader sticker/L of water.

SPRAYS DURING REST PERIOD

- Apply Bordeaux paste (10%) on pruned ends. Immediately after pruning. Spray Bordeaux Mixture (1%)
- Spray Bordeaux Mixture (1%) at 15 days' interval or alternate with 2-Bromo-2-nitropropane-1,3-diol 95% WP @ 0.5 g/L + Copper oxychloride 50% WP @ 2.5 g/L spray. Continue through defoliation.

POINTS TO REMEMBER

1. A pomegranate surfaces are glossy, hence, preferably **add good quality non non-ionic spreader sticker with sprays for uniform coverage with pesticide. DO NOT USE SPREADER STICKER WITH BORDEAUX MIXTURE.**
2. Insecticides and fungicides may be mixed depending on compatibility to reduce number of sprays. To prepare spray mixture, prepare dilute solutions of each chemical separately and mix to make total volume. If precipitate is formed, either mixture chemicals are not compatible or pH is not proper. The spray solution should have a pH of 6.5 -7 for good results.
3. In case no rains are there for long duration or disease/blight is not increasing, sprays can be taken at 10- 15 days' interval instead of 7days.
4. The active ingredients (a.i.) in Streptocycline are Streptomycin sulphate 90%+ Oxy tetracycline 10% and in '2-bromo, 2-nitropropane-1, 3-diol 95%.' Both Streptocycline are available with different trade names from different companies. check if a.i. is less then increase the dose accordingly.
5. Growth regulators, micronutrient mixtures should be taken separately.

PREPARING SALICYLIC ACID SPRAY SOLUTION

METHOD I

Dissolve 30 g Salicylic acid in 30-50 ml spreader sticker then add 1-2liter water/warm water with spreader sticker. When Dissolved, make volume 100 liter by adding 98 liter water for spraying.

OR

METHOD II

Dissolve 30 g Salicylic acid in 80-90 ml ethanol; When dissolved, add 100 liter water

PREPARATION OF BORDEAUX MIXTURE

Composition of Bordeaux Mixture (BM)

Chemical	Quantity for preparing Bordeaux Mixture	
	BM 1%	BM 0.5%
Copper Sulphate (CuSO ₄ · 5H ₂ O ₂)	1kg (1000g)	0.5kg (500g)
Quick lime/Calcium Oxide (CaO) OR Calcium hydroxide Ca(OH) ₂ [Use fresh stocks]	* 300-400 g	* 150-200 g
Water	100 L	100 L
*Depending on purity quantity varies		

Method of Preparation of Bordeaux Mixture

Day 1: Weigh required quantity of Lime and Copper sulphate and soak separately overnight in water

Day 2: Next day strain through sieve and mix simultaneously in third container with stirring, Check and adjust pH around 7.

- Dip an iron knife or a nail in the upper layer of the solution for a few minutes.
- A brick red or rusty brown deposition on the metal surface indicates presence of excess copper in the mixture. Add more lime solution to the mixture till no rust appears on the iron knife.
- To test the pH of mixture, use pH paper of good quality/pocket pH meter and match the colour to pH 7. If colour is below 7 add more lime.

Points to Remember

- Use immediately after preparation.
- Do not use iron or galvanized vessels, Use plastic vessels, earthen or wooden barrels.
- Do not mix Bordeaux mixture with other chemicals or pesticides.
- Always strain the mixture through a sieve before adding it to spray tank.

STEM PASTES

PREPARATION OF BORDEAUX PASTE (10%) and RED SOIL PASTE

Bordeaux Paste

Chemical	Quantity
Copper Sulphate (CuSO ₄ · 5H ₂ O)	1kg
Quick lime/Calcium Oxide (CaO) Or Calcium hydroxide Ca(OH) ₂ [Use fresh stocks]	1 Kg
Water	10L

Dip both Copper sulphate and lime separately in 5 litre water at night and mix together in morning for making 10 litre paste;

NOTE: No pH to be adjusted in paste

If Pin/shot hole borer problem also add Chloropyrifos 20% EC @ 20 ml

OR Emamectin Benzoate 5% SG in the paste preparation.

Red Soil Paste

Chemical	Quantity
Red soil	4 kg
Chloropyrifos 20% EC @ 20 ml OR Emamectin Benzoate 5% SG	20ml 20g
Copper oxychloride (COC)	25g
Water	10 L

NOTE: Soak Red soil in water at night, morning mix the other ingredients

NOTE: See video for preparation of Bordeaux paste and Bordeaux mixture - on the DD KISAN LINK <https://youtu.be/JXwWBDiUdyA>)

EMERGENCY MEASURES FOR BACTERIAL BLIGHT MANAGEMENT

In case of sudden increase in Bacterial blight on fruits; take 2 combination sprays of Streptocycline (90%+10%) @ 0.5 g/L + 2-bromo, 2-nitro propane-1, 3-diol (95%) @ 0.5 g/L + Copper fungicides @ 2.0 – 2.5 g/L **OR** Carbendazim 50% WP@1 g/L or Mancozeb75% WP @ 2 g/L in alteration at 5 days' interval, however, the PHI of chemicals should be kept in mind while taking emergency sprays.

CALCULATING RIGHT DOSE

- Note the actual percentage of the chemicals (Streptocycline and Bronopol) in the brands available in market.
- Different brands have different percentage of active ingredients in the product. Note ingredient/Assay/purity % in each product purchased and take right dose for spray.

CHEMICAL	INGREDIENT (%)	QUANTITY (g/L)#
STREPTOCYCLINE: Streptomycin Sulphate + Tetracyclinehydrochloride	90%+10% = 100%	0.5 g /litre 6g pack/12 litre 50g/100 litre
	09%+01% = 10%	5 g /litre 500g/100 litre
BRONOPOL: 2-bromo-2-nitropropane-1.3 diol	95-97%	0.5 g /litre 20g pack/40litre
	27%	1.8 g/ litre 180 g/ 100 litre
# PLEASE NOTE: Blight cannot be controlled below these doses; pathogen will develop resistance if sprays below are taken below these doses.		

STEM/ SHOT/PIN HOLE BORER MANAGEMENT

- Regularly monitor the orchards, especially after the receipt of the first unseasonal rains (May-June).
- If stem borer adults are found (observe under canopy) collect and kill by immersing in kerosene or insecticides mixed water (Cypermethrin 25% EC OR Emamectin Benzoate 5% SG or any contact insecticide @ 1 ml/L water.
- Take spray on the stem with neem oil 1% (10000ppm) @ 3 ml/L + 0.3 ml of spreader sticker/L water.
- **Stem pasting:** with Red Soil or Bordeaux Paste
- For detailed management practices for stem and Shot/Pin hole borer, follow the advisory available on NRCP website.

NEMATODE MANAGEMENT

1. For new plantation, **Infected planting material** is the major and primary source of spread of root-knot nematode in new localities even to other states. So, the planting material (sapling and the potting mixture) should be free from root knot nematode.
2. As a preventive measure, use of promising bio-formulations twice a year such as *Aspergillus niger*, *Trichoderma viride* **OR** *T. harzianum*, *Pseudomonas fluorescens*, *Paecilomyces lilacinus* @ 1 kg/acre after multiplying in the well decomposed FYM.
3. If nematode infection is high, use the granular nematicides, **Fluensulfone 2% GR**. Make a small pit (5-10 cm) under the dripper and apply the granular chemical @ **10 gm per dripper** (Maximum dose should not exceed 40 gm/plant); cover it with the soil and start watering or use **Fluopyrum34.48% SC@ 2 ml/plant**. Plants should be sufficiently watered day before drenching. Mix 2 ml of the nematicide in two litre of water and pour 500 ml per dripper (4 drippers/plant) or 1000 ml per dripper (2 drippers/plant).
4. These both nematicides should be used either in the rest period or in the beginning of bahar season. Use of these nematicides can be handy in keeping the nematode population under check. Once the nematode population is reduced, start the use of promising biological as listed above.

PRECAUTIONS

1. Take only need based sprays at recommended doses, too many sprays increase the disease.
2. Always remove and burn all affected fruits before starting any spray.
3. Combine insecticides, fungicides or micronutrient sprays with bactericidal sprays depending on compatibility to reduce number of sprays. Mixture should not form precipitate.
4. Take without fail, additional spray with a bactericide after the rains -when plant surfaces dry up.

PLEASE NOTE

- *Recommended agrochemicals for the management of various insect pests and diseases are of advisory nature for the Good Pomegranate Production Practices and therefore, not covered under any legal scrutiny.*
- *The responsibility of safe usage of chemicals for the management of any of the above pests and diseases will rest with the growers or exporters in compliance with the requirements of the Exporters/EU. ICAR-National Research Centre on Pomegranate shall not be covered under any legal scrutiny.*

DISCLAIMER

The document has been compiled on the basis of available information for guidance and not for legal purposes

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