

Recommended Technologies - 2021

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani hosted the Joint Agricultural Research Committee Meeting (JOINTAGRESCO) during December 24-30, 2021 in Online mode in collaboration with all State Agricultural Universities of Maharashtra and Maharashtra Council of Agricultural Education and Research, Pune. The details crop varieties and implement released along with specific recommendations on production technology, rainwater management, value addition based on research work are as under,

Release of Variety:

1. *Rabi Jowar Hurda* (Parbhani Vasant PVRSG 101)

The Hurda purpose *Rabi* sorghum variety PVRSG 101 recorded higher tender grain and green fodder yield over the check varieties SGS 8-4, Phule Madhur and PKV Ashwini. The grains are tender, sweet and easily threshable. It is moderately tolerant to insect pests like shoot fly, stem borer and disease charcoal rot. The Hurda purpose sorghum variety Parbhani vasant (PVRSG 101) is recommended for release in *Rabi* sorghum growing areas of Marathwada region.

2. Soybean (MAUS 725)

Soybean variety MAUS 725 recorded higher seed yield over local and national checks. It was found moderately resistant to various pests and diseases. Hence, the soybean variety MAUS 725 is recommended to release for cultivation in Marathwada region.

3. Safflower PBNS 154 (Parbhani Suvarna)

The variety of safflower PBNS 154 (Parbhani Suvarna) recorded 23.62 % and 27.69% higher seed yield over checks PBNS-12 and Shrdha, respectively. The variety has 30.90% oil content and tolerant to *Alternaria* leaf spot, moderately resistant to *Fusarium* wilt diseases and Aphid pests. Therefore, PBNS 154 (Parbhani Suvarna) is released under rainfed condition for Marathwada region.

Implement Released :

1. Design and Development of Tractor Drawn Inter-Cultivator Cum furrow opener and Sprayer with slim tyre

VNMKV tractor operated Inter- Cultivator Cum furrow opener and Sprayer with slim tyre is recommended for inter cultivation, reopening of furrow and insecticide spraying at a time .

2. Development Bullock drawn Bed Maker

VNMKV developed Bullock drawn bed maker is recommended for release for making broad bed of 2 to 5 ft. wide.

3. Development of single bullock drawn Ridger

VNMKV developed Single Bullock drawn Ridger is recommended for release for making ridge and furrow in all type of crops.

4. Design and Development of Cutting Mechanism of Flail Mower

VNMKV developed Flail Mower is recommended for cutting of Grass from open grounds barren lands and weed infested fields

5. Design and Development of manually operated Vegetable Transplanter

VNMKV developed manually operated vegetable transplanter is recommended to release for transplanting of Vegetable crops

6. Design, Development and Performance Evaluation of Hand Operated Fresh Sweet Corn Sheller

VNMKV developed hand operated fresh sweet corn sheller of capacity: 8 kg/h and 97 % shelling efficiency is recommended to release for shelling fresh sweet corn kernels.

7. Design and development of bullock drawn multipurpose mobile solar energy cart

VNMKV developed multipurpose bullock drawn mobile solar energy cart is recommended for release for spraying of pesticide and weedicide in different crops up to the height of 180 cm, for spraying in orchard crops up to 300 cm, for water lifting from 10 to 40 m head and generation of electricity for lighting of electrical gadgets up to 500 W.

Technologies recommended

1. To get higher hurda, green fodder yield and monetary returns from hurda sorghum in summer season, it is recommended to complete the sowing up to 8th January in Marathwada region.
2. The following Stepwise regression equation showing the inter-relationship between yellow vein mosaic virus disease in okra and weather parameters is recommended for forewarning of yellow vein mosaic disease incidence during Summer season in the Marathwada region.

$$YVMV (\%) = -25.181 + 4.255 \times T_{min} - 1.040 \times RH1 + 6.567 \times WV$$

Where,

YVMV= Yellow Vein Mosaic Virus disease incidence (%), T_{min} = Minimum temperature (°C), RH1=Morning relative humidity (%) and WV=Wind velocity (Km/h)

3. The enhancement of drought tolerance, yield, monetary return and improvement in soil properties under wheat, seed treatment of liquid *Bacillus licheniformis* @ 100ml / 10 kg seed was found as promising for drought tolerance along with recommended dose of fertilizers and is recommended to rainfed wheat.
4. Very deep Vertisols (Typic Haplusters) contain $CaCO_3$ less than 15 per cent should be selected for sustainable and higher production of tamarind in Marathwada region of Maharashtra is recommended.
5. For the enhancement of pigeon pea yield, monetary returns and improvement in soil properties, seed treatment of liquid *Pseudomonas striata* as zinc solubilizer @ 100 ml/10 kg seed + application of 30 kg $ZnSO_4$ ha⁻¹ is recommended to pigeon pea along with recommended dose of fertilizers.
6. In Vertisol of Marathwada region, to get maximum yield and monetary returns of pigeon pea, application of K_2O and micronutrient grade-I @ 25 kg ha⁻¹ or micronutrient grade –II @ 0.5% at flowering stage is recommended in addition with recommended dose of fertilizer (i.e. 25:50 N and P_2O_5 kg ha⁻¹).
7. To obtain higher grain yield and net monetary returns, it is recommended to apply 100 % RDF (80:50:50 Kg/ha) + Soil Application of Micronutrient Grade - I (25 kg/ha) or RDF 100 % (80:50:50 Kg/ha)+ Foliar Application of Micronutrient Grade-II (0.5 %) (2 Sprays at 30 & 50 DAS) for upland paddy in Marathwada region.
8. It is recommended to apply the 75 % RDF + FYM 5 t/ha to obtain highest rice grain yield and monetary returns and to obtain higher rice equivalent yield and monetary returns it is recommended to follow rice + soybean (3:2 in replacement series) intercropping system or rice + black gram (3:2 in replacement series) intercropping system for Marathwada region.

Varieties Released



Soybean - MAUS 725



Sorghum - Parbhani Vasant (PVRSG 101)



Safflower - Parbhani Suvarna (PBNS 154)

Implements Released



Multipurpose Mobile Solar Energy Cart



Animal Drawn Bed Maker



Single Bullock Drawn Ridger



Cutting Mechanism of Flail Mower



Tractor Drawn Inter- Cultivator Cum Sprayer For Soybean and Cotton with slim tyres



Manually Operated Vegetable Transplanter

Technologies Recommended



Cotton + Soybean Intercropping



Complete Mechanization in Soybean



Summer Onion on Bed Plantation



Pigeonpea on Drip Irrigation



Paired Row Bt Cotton



Paddy + Soybean with Nutrient Management

Technologies Recommended



Nutrient Management in Wheat



Ajwain - AA-2



Fennel - F1



Silver Black Poly Mulching for Brinjal



Poly-packing for Soya Paneer



Carrot Slices for RTE

Technologies Recommended



Broccoli Soup Powder



Probiotic Juice of Carrot + Tomato



Linseed Cookies



Date Contained Chocolate Bar



Guar Gum Contained Pizza Souce



Cold Drink with Kiwi Fruit Juice + Lemon Grass

9. To obtain higher fodder yield and monetary returns from kharif forage sorghum, the application of fertilizer dose 100:50:50 NPK kg ha⁻¹ (50:50:50 N:P:K kg ha⁻¹ as basal dose and 50 N kg ha⁻¹ 30 DAS) is recommended for Marathwada region.
10. Soybean + pigeonpea (4:2) and Cotton + Soybean (1:1) biannual cropping system in rotation is recommended for rainfed area of Marathwada region to obtain higher seed / grain yield. The conventional tillage with RDF (50%) + FYM (@2.5 ton/ha) is also recommended for Soybean + pigeonpea (4:2) intercropping system. Similarly, the conventional tillage with RDF is recommended for Cotton + Soybean (1:1) intercropping system for obtaining higher yield as well as to improve the soil health and organic carbon.
11. Complete mechanisation along with Broad bed and furrow (BBF) method of sowing for soybean-safflower sequence cropping is recommended for obtaining higher seed yield, monetary returns and proper rainwater conservation.
12. Sowing of pigeonpea at crop geometry of 60-120cm x 20cm or 90cmx20cm with foliar application of Brassinosteroids @ 0.1 ppm OR NAA @ 40 ppm, at bud initiation and flowering stage of pigeonpea is recommended for higher seed yield along with maximum economic returns.
13. For higher bulb yield and net monetary returns of summer onion in Marathwada region it is recommended to schedule alternate day drip irrigation at 60 % crop evapo-transpiration through inline lateral laid at the centre of raised bed having six rows of onion planted at the spacing of 15 x 7.5 cm and drip fertigation of 80:40:40 N, P₂O₅, K₂O kg ha⁻¹ with N and K₂O in 10 equal splits @ 8 kg and 4 kg respectively and P₂O₅ in 5 equal splits @ 8 kg ha⁻¹ at an interval of 7 days from transplanting to 70 days after transplanting.

Irrigation schedule for summer onion as per 0.6 ETc along with the volume of water required per plant (litre) and operating time for drip irrigation system with discharge rate of 2.4 lph and inline lateral of 16 mm diameter with emitters spaced at 30cm.

| M.W | Week After Sowing for irrigation | Volume of water required plant ⁻¹ (litre) | Operating time (min.) | Weekly Temperature °C | |
|-----|----------------------------------|--|-----------------------|-----------------------|------|
| | | | | Max. | Min. |
| 3 | Sowing to 1 st Week | 0.023 | 14 | 30.3 | 12.2 |
| 4 | In 2 nd WAS | 0.024 | 14 | 30.4 | 12.1 |
| 5 | In 3 rd WAS | 0.026 | 16 | 30.0 | 11.1 |
| 6 | In 4 th WAS | 0.025 | 15 | 30.1 | 12.9 |
| 7 | In 5 th WAS | 0.043 | 26 | 32.0 | 13.4 |
| 8 | In 6 th WAS | 0.068 | 41 | 34.9 | 15.1 |
| 9 | In 7 th WAS | 0.070 | 42 | 34.5 | 14.7 |
| 10 | In 8 th WAS | 0.067 | 40 | 35.2 | 16.3 |
| 11 | In 9 th WAS | 0.074 | 44 | 35.4 | 18.6 |
| 12 | In 10 th WAS | 0.071 | 42 | 37.2 | 17.8 |
| 13 | In 11 th WAS | 0.078 | 47 | 39.5 | 19.2 |
| 14 | In 12 th WAS | 0.068 | 41 | 39.5 | 20.7 |
| 15 | In 13 th WAS | 0.061 | 37 | 40.1 | 21.5 |
| 16 | In 14 th WAS | 0.047 | 28 | 40.3 | 22.2 |
| 17 | In 15 th WAS | 0.050 | 30 | 42.0 | 22.5 |

The fertigation schedule along with the quantity of water soluble fertilizers required is given below:

| Sr. No. | Days after transplanting (DAT) | Fertilizer dose (80:40:40 N, P ₂ O ₅ , K ₂ O kg/ha) | | | Water soluble fertilizers (kg/ha) | | |
|---------|--------------------------------|--|----|----|-----------------------------------|---------|--------|
| | | N | P | K | Urea | 12:61:0 | 0:0:50 |
| 1. | 0-7 | 8 | 8 | 4 | 13.95 | 13.11 | 8 |
| 2. | 8-14 | 8 | 8 | 4 | 13.95 | 13.11 | 8 |
| 3. | 15-21 | 8 | 8 | 4 | 13.95 | 13.11 | 8 |
| 4. | 22-28 | 8 | 8 | 4 | 13.95 | 13.11 | 8 |
| 5. | 29-35 | 8 | 8 | 4 | 13.95 | 13.11 | 8 |
| 6. | 36-42 | 8 | - | 4 | 17.36 | - | 8 |
| 7. | 43-49 | 8 | - | 4 | 17.36 | - | 8 |
| 8. | 50-56 | 8 | - | 4 | 17.36 | - | 8 |
| 9. | 57-63 | 8 | - | 4 | 17.36 | - | 8 |
| 10. | 64-70 | 8 | - | 4 | 17.36 | - | 8 |
| Total | | 80 | 40 | 40 | 156.55 | 65.55 | 80 |

14. For higher seed yield and net monetary returns of pigeonpea in Marathwada region, it is recommended to schedule alternate day drip irrigation at 80 % crop evapotranspiration for the crop sown at the spacing of 150 x 30 cm through inline lateral laid at 150 cm apart and drip fertigation of 20:40:20 NPK kg ha⁻¹ in ten splits through WSF out of which 20 % N and 40 % P in two splits at 0-30 DAS, 30% N, P and 25 % K in three splits at 31-60 DAS, 30 % N, P and 40% K in 3 splits at 61-90 DAS and 20% N and 35 % K in two splits at 91-120 DAS.

| M.W | Week After Sowing for irrigation | Volume of water required plant ⁻¹ (litre) | Operating time (min.) | Weekly Temperature ° C | |
|-----|----------------------------------|--|-----------------------|------------------------|------|
| | | | | Max. | Min. |
| 26 | Sowing to 1 st Week | 0.46 | 12 | 33.2 | 22.8 |
| 27 | In 2 nd WAS | 0.46 | 12 | 32.3 | 22.9 |
| 28 | In 3 rd WAS | 0.52 | 15 | 31.2 | 22.6 |
| 29 | In 4 th WAS | 0.55 | 16 | 31.9 | 22.6 |
| 30 | In 5 th WAS | 1.23 | 34 | 30.6 | 22.4 |
| 31 | In 6 th WAS | 1.39 | 35 | 31.1 | 22.1 |
| 32 | In 7 th WAS | 1.30 | 33 | 30.2 | 22.2 |
| 33 | In 8 th WAS | 1.16 | 29 | 29.5 | 21.7 |
| 34 | In 9 th WAS | 1.78 | 51 | 30.6 | 21.4 |
| 35 | In 10 th WAS | 2.27 | 59 | 30.7 | 21.4 |
| 36 | In 11 th WAS | 2.55 | 64 | 31.7 | 21.2 |
| 37 | In 12 th WAS | 2.96 | 74 | 31.5 | 21.4 |
| 38 | In 13 th WAS | 2.34 | 58 | 31.5 | 21.8 |

| M.W | Week After Sowing for irrigation | Volume of water required plant ⁻¹ (litre) | Operating time (min.) | Weekly Temperature ° C | |
|-----|----------------------------------|--|-----------------------|------------------------|------|
| | | | | Max. | Min. |
| 39 | In 14 th WAS | 3.43 | 86 | 32.2 | 21.3 |
| 40 | In 15 th WAS | 3.87 | 100 | 33.2 | 20.6 |
| 41 | In 16 th WAS | 3.72 | 97 | 32.7 | 19.3 |
| 42 | In 17 th WAS | 4.01 | 107 | 32.3 | 19.1 |
| 43 | In 18 th WAS | 3.85 | 96 | 32.1 | 18.9 |
| 44 | In 19 th WAS | 3.65 | 91 | 31.9 | 16.9 |
| 45 | In 20 th WAS | 3.11 | 78 | 32.0 | 15.0 |
| 46 | In 21 th WAS | 2.58 | 64 | 32.0 | 14.1 |
| 47 | In 22 nd WAS | 2.19 | 58 | 31.1 | 15.2 |
| 48 | In 23 rd WAS | 1.85 | 49 | 30.0 | 13.7 |
| 49 | In 24 th WAS | 1.22 | 33 | 30.5 | 12.7 |
| 50 | In 25 th WAS | 0.69 | 19 | 29.9 | 14.8 |
| 51 | In 26 th WAS | 0.76 | 19 | 28.1 | 11.2 |

Irrigation schedule for pigeonpea as per 0.8 ETc along with the volume of water required per plant (litre) and operating time for drip irrigation system with discharge rate of 2.4 lph and inline lateral of 16 mm diameter with emitters spaced at 30cm.

Note : Irrigation may be scheduled on alternate day.

The fertigation schedule along with the quantity of soluble fertilizer required is given below

| Duration (Days) | No. of splits | Time of application | Fertilizer dose (20:40:20 NPK Kg/ha) | | | Soluble fertilizers (kg/ha) | | |
|-----------------|---------------|---------------------|--------------------------------------|----|----|-----------------------------|---------|--------|
| | | | N | P | K | Urea | 12:61:0 | 0:0:50 |
| 01-30 | 2 | 10 and 20 DAS | 4 | 16 | - | 1.86 | 13.11 | - |
| 31-60 | 3 | 31, 40 and 50 DAS | 6 | 12 | 5 | 7.89 | 19.67 | 10 |
| 61-90 | 3 | 61, 70 and 80 DAS | 6 | 12 | 8 | 7.89 | 19.67 | 16 |
| 91-120 | 2 | 91 and 110 DAS | 4 | 0 | 7 | 8.68 | - | 14 |
| Total | 10 | - | 20 | 40 | 20 | 26.32 | 52.45 | 40 |

15. Cultivation of Carom seed (Ajwain) cv. AA-2 is recommended for gaining higher yield and net return in Marathwada condition during Rabi season.
16. Cultivation of Fennel (Saunf) cv. AF-1 is recommended for gaining higher yield and net return in Marathwada region during Rabi season.
17. Silver Black Polythene mulch is recommended for gaining higher yield and net return in Brinjal during summer season under Marathwada condition.
18. It is recommended to prepare most acceptable and medicinally healthy Shrikhand, as per method developed by VNMKV, Parbhani by incorporation of encapsulated curcumin @ 0.04 per cent of Chakka.

19. VNMKV, Parbhani developed technology for preparation of kurdai from wheat batter (PBN-51) using paneer whey as soaking agent for 4 days at room temperature is recommended
20. For preparation of chocolate coated date moth bean bar use of 50% dark chocolate, 40% date paste and 10% moth bean malt and storing it at 50C up to 60 days is recommended.
21. Use of rice flour, horse gram malt, sugar, carrot powder and milk powder in the proportion of 60:20:10:5:5 for preparation of low density rice based nutrifood is recommended.
22. It is recommended that good quality acceptable probiotic beverage can be prepared by carrying out 20 hours fermentation of carrot and tomato juice (70:30 and 160Bx) inoculated using 10 percent mixed culture of *Lactobacillus acidophilus* and *Saccharomyces boulardii* (1:1).
23. Preparation of good quality instant Broccoli tomato soup mix by using mainly 15 percent broccoli powder and 45 percent Tomato powder is recommended.
24. It is recommended that good quality nutra cookies prepared by using mainly refined wheat flour and roasted flaxseed flour in the ratio of 90:10.
25. It is recommended to prepare good quality kiwi fruit - lemongrass RTS beverage by using kiwi fruit juice and lemongrass concentrated extract 10:2 proportion which has considerable ascorbic acid content.
26. It is recommended to prepare the noodles with improved nutritional and sensory qualities by using 90 per cent composite flour (70% wheat flour+30% sorghum flour) blended with 10 per cent chia seeds powder.
27. It is recommended that the pet dog food crackers should be prepared by incorporation of 15% Guar Meal Protein Isolate to have higher protein content and palatability as per single bowl test.
28. Preparation of Pizza Sauce having higher acceptability and high content of dietary fibre using 7% partially hydrolyzed guar gum (PHGG) is recommended.
29. It is recommended that families need to involve grandparents in caring grandchildren as they are found to be playing vital role in child upbringing and which in turn enabling grandparents to lead happy, contented and dignified life.
30. It is recommended that intensive workshops have shown positive influence on anganwadi workers for enhancing their knowledge in the area of early childhood development and for their effective role performance, hence such effective and intensive workshops are recommended for their empowerment.
31. As intervention imparted by VNMKV found to be effective for empowering rural young women on reproductive, maternal and child health care is recommended for the use by the Dept. of women and child welfare.
32. Protein and Energy rich ready to use 100g nutridense mix (Wheat flour, Soyabean flour, Groundnut, Sunflower seeds, Skimmed milk powder and Sugar 20:20:10:20:20:10 respectively) is recommended to include in daily diet of underweight women in the form of Roti, Lapsi and Biscuits for gaining weight.
33. The set of VNMKV developed objective type tests are recommended for assessing managerial skill of homemakers related to time, money and human energy.
34. It is recommended that ecofriendly dye from waste and dry petals of red rose flowers can be utilized for dyeing cotton fabric
35. For management of pod borer complex of pigeonpea and getting higher yield with monetary returns, the spraying of *Bacillus thuringiensis* @ 20 gm in 10 litre of water at 50% flowering stage and second spraying at pod development stage are recommended.

36. Based on optical properties of plastic mulches 30 micron silver-black plastic mulch is recommended for controlling soil temperature and weed infestation of summer vegetable crops in vertisol.
37. VNMKV developed low cost packaging technology is recommended of applying an edible coating (6% Whey Protein Concentrate, 5% Glycerol 1% Potassium Sorbet Solution) on soypaneer and store it in vacuum packaging (LDPE 200 gauge) at refrigerated condition ($5 \pm 1^{\circ}\text{C}$) to enhance the shelf life of soypaneer up to 22 days.
38. VNMKV developed combo-process technology is recommended for the production of steam blanched (2 min), freeze –thaw pretreated (freezing temperature : 25°C and thawing temperature : 5°C) osmo-convectively dried (syrup concentration : 50°Brix , syrup temperature : 50°C , immersion time : 4 h; tray drying temperature : 60°C) RTE carrot slices.
39. Meteorological week wise reference evapotranspiration (mm/day) and GIS spatial maps developed by VNMKV for all tahsils of Marathwada region are recommended for irrigation planning and Scheduling.
40. It is recommended that State Department of Agriculture (Govt. of Maharashtra) should organize training programmes for TSP beneficiaries on turmeric production technology, processing and marketing to get maximum returns.
41. Use of social media among the extension personnel of the Marathwada region for extension purpose is increasing, hence it is recommended to establish a media lab at the university level for quick and effective production of agricultural technology based videos as per the demand of farmers and which are useful to share through social media.
42. Use of social media among the extension personnel of the Marathwada region for extension purpose is increasing, hence it is recommended that Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani should organise training programme on effective use of social media and e-content development in local language for dissemination of agricultural technology.
43. To forecast the soybean prices in latur market, it is recommended to use SARIMA time series model of order (0, 1, 3)(0, 1, 1)₁₂.
44. It is recommended that the APMCs in Maharashtra should have the strong mechanism for price forecasting which will be helpful for the producers to make appropriate decision of marketing to get benefit of better prices as well as area allocation under the respective crop.



Eco-friendly Cloth Preparation



Tribal Gond Art for Cloth Preparation