

DIRECTOR OF RESEARCH

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Research Recommendations released during 2013 - 2014

(Approved by Joint Agresco - 2014)

1. Crop Improvement :

Sr. No.	Name of crop	Variety	Important features
A) Varieties proposed for release:			
I) Field Crops :			
1.	Cotton	AKH-9916	a. Suitable for Rain-fed, b. Duration: 170-180 days c. Yield: 12-1q/ha d. Resistant to sucking pest
II) Fruit Crop :			
2.	Acid Lime	PDKV, Chakradhar	a. Seed less, Thorn less, b. Acidity: 5.9% c. Fruit size: medium d. Ascorbic acid: 30.3mg, e. Yield :18-20t/ha, f. Peel thickness: 1.02mm
3.	Acid Lime	PDKV, Bahar	a. fruit size: Big, b. Yield : 30-35 t/ha, c. peel thickness:1.62mm, d. Juice: 53 % e. Acidity:6.18%, f. Ascorbic acid31.47%
III) Vegetable Crops :			
4.	Turmeric	GDT-06-02 PDKV Waigaon	a. Yield: 260q/ha b. Early maturity(220days) c. Resistant to leaf spot, d. Curcumin:6.7%, e. attractive colour of powder
5.	Brinjal	AKLB-9	a. Thorn less, b. Fruit colour: pale green with white streaks, c. Suitable for summer and rainy season d. Early maturity
6	Limabean	AKKLB-2	a. Long pods b. Attractive seed colour and Palatable,

			c. Yield: 35-40q/ha
III) Flower Crop :			
7.	Gladiolus	AKGL-04-06-A (PDKV,Roshani)	a. Thick petals and good visual texture b. Longer shelf life. c. Good corm and cormel production potential and better storability d. Attractive purplish white petals with white blotch in throat on lower petals e. More florets per spike f. Resistant to <i>fussarium</i> wilt
8	Chrysanthemum	CHR_Mut-05-02 (PDKV Ragini)	a. New colour pattern i.e. Red tinge on yellow petals b. More number of flowers per plant c. High yield (179.40 q/ha) d. Moderately resistant to <i>fussarium</i> wilt
New Farm Impliment/Machinery			
SN.	Name of farm implement /machinary		Important Features
1	PKV Turmeric Harvester		It is recommended that to use small size tractor drawn PDKV turmeric digger for uprooting the turmeric rhizomes.

Production Technology

1) In Eastern Vidarbha zone to obtain high productivity of paddy alternative to paddy transplanting, drilling of paddy at 20 cm spacing with 100 kg/ha seed rate in the first week of July with application of pendimethline 30 EC% i.e. 3.33 l/ha immediately after sowing and then weeding 30DAS is recommended

2) It is recommended that for obtaining higher grain yield and monetary returns of wheat and chickpea crops as well as for improving organic carbon of soil, 2.0 t/ha of soybean crop residue should be incorporated before rabi sowing and as per schedule 100 % recommended fertilizer doses should be applied

3) In Eastern Vidarbha zone for obtaining higher productivity of chickpea under paddy-chickpea crop sequence, chickpea sowing should be done from 15 November to 30 November is recommended

Soil Science and Agri. Chemistry

4) For sustaining soil fertility, soybean productivity and obtaining higher monetary returns, application of 50% recommended N (15kg ha^{-1}) through glyricidia (2 to 3 t /ha) +50% N through inorganics + bio-fertilizers (Rhizobium & PSB 25g kg^{-1} seed treatment) + $75\text{kg P}_2\text{O}_5 + 25\text{kg K}_2\text{O ha}^{-1}$ is recommended as an Integrated Plant Nutrient Supply System under dryland condition in Vidarbha.

5) For sustaining soil fertility, cotton productivity and obtaining higher monetary returns, application of 50% N (25kg ha^{-1}) through glyricidia (3 to 4 t/ha) +50% N through inorganics + biofertilizers (Azotobactor& PSB 25g kg^{-1} seed treatment) + $25\text{kg P}_2\text{O}_5 + 25\text{kg K}_2\text{O ha}^{-1}$ is recommended as an Integrated Plant Nutrient Supply System under dryland condition.

6) For soybean crop, the critical levels of zinc is recommended as 0.65 mg kg^{-1} in soil and 24 mg kg^{-1} in plant at grand growth stage, useful for zinc management in medium deep black swell-shrink soils.

7) For sorghum crop, the critical levels of potassium is recommended as 330 kg /ha in soil and 2.60 percent in plant at grand growth stage , is recommended in medium deep black swell-shrink soils.

8) In zinc and iron deficient soils of Maharashtra, for obtaining higher yield of sweet orange and improvement in fruit quality, soil application of Zn-EDTA @ 50 g /tree and Fe-EDTA @ 100 g /tree or one foliar spray of Zn-EDTA @ 0.5 % and Fe-EDTA @ 1.0 % one month after fruit set along with recommended dose ($50\text{ kg FYM} + 1200\text{ g Nitrogen} + 400\text{ g phosphorus per tree}$) is recommended.

Weed Science

9) For effective weed control, more yield and economic return in mustard, 2 weeding and 2 hoeing at 20 and 40 DAS or pre-emergence application of herbicide Oxadiargyl (80 WP) @ 90 ga.i. ha^{-1} or Pendimethalin (30 EC) @ $1.0\text{ kg a.i. ha}^{-1}$ is recommended.

Plant Protection

Entomology

10) It is recommended that the thrips incidence on rainfed cotton in Vidarbha region can be predicted a week advance by following equation. The resulting negative value will indicate absence of thrips incidence and positive value will indicate possibility of occurrence of incidence.

$$\sqrt{Y + 0.5} = 1.41 + 0.052 X_1^* + (-0.123 X_2^{**}) + (-0.024 X_3^{**}) + 0.226 X_4^{**}$$

Where,

$\sqrt{Y+0.5}$ = Square root of Number(Y+0.5) of thrips per leaf,

X1= Minimum temperature (°C),

X2= Sunshine hours,

X3 = Evening relative humidity (%),

X4=Wind speed (Km/hr)

** = Significant at 1% , * = Significant at 5%.

11) It is recommended that the leaf hopper incidence on cotton crop grown under rainfed situation in Vidarbha region can be predicted a week advance by following equation. The resulting negative value will indicate absence of leaf hopper incidence and positive value will indicate possibility of occurrence of incidence.

$$\text{Log}_{10}(Y+0.5) = -0.325 + 0.042 X_1^{**} + (-0.042 X_2^{**}) + 0.001 X_3 + 0.00 X_4 + (-0.01 X_5) + (-0.023 X_6) + (-0.012 X_7)$$

Where ,

$\text{Log}_{10}(Y+0.5)$ = $\text{Log}_{10}(Y+0.5)$ of number of leafhoppers per leaf,

X_1 = Minimum temperature ($^{\circ}\text{C}$),

X_2 = Sunshine hours,

X_3 = Relative humidity morning (%),

X_4 = Relative humidity evening (%),

X_5 = Rain Fall (mm),

X_6 = Rainy days,

X_7 = Wind speed (Km/hr),

** = Significant at 1%

12) For management of whitefly on Bt cotton, ETL based spraying of Difenthiuron 50 WP @ 12 g/10 lit. water is recommendation.

13) For the effective management of citrus psylla, spraying of novaluron 10 EC @ 5.0 ml per 10 litre of water on new flush of Nagpur mandarin is recommended.

14) For the management of Brown Plant Hopper in Rice ETL based spraying of Imidacloprid 17.8 SL @ 2.2 or Fipronil 5 SC @ 20ml or Thiamethoxam 25 WG @ 2g per 10 litre water is recommended

15) For the management of soybean leaf defoliator (Tobacco leaf eating caterpillar and semi looper) Chlorpyrifos 20EC @ 30ml or Indoxacarb 14.5 SC @ 9.3 ml per 10 litre is recommended

16) For the management of leafhopper and whitefly on okra, installation of Yellow sticky trap @ 100 traps/ha at 15 cm height above the crop canopy is recommended with following specifications.

- Foam sheet of 4 mm thickness
- Size of trap 25 cm X 15 cm (60 sq. inches)
- Bright or Brilliant yellow colour
- Castor oil as a sticky material
- Smearing of castor oil at weekly interval
- Install the trap facing North east and South west direction from onset of sucking pest incidence

- Trap should be installed at 20 cm apart from plant so as to avoid contact of plant

Pathology

17) For the occurrence of twig blight in Nagpur mandarin in advance can be predicted by following equation. The resulting negative value will indicate absence of disease and positive value will indicate possibility of occurrence of disease.

$$Y = -76.19 + 3.085X_1 - 1.741X_2 + 0.0134X_3 + 0.521X_4 + 0.190X_5 + 0.101X_6 - 0.678X_7$$

Where,

Y= Per cent of incidence of Twig blight

X1= maximum temperature (° C)

X2= Minimum temperature (° C)

X3= Morning Humidity (%)

X4= Evening Humidity (%)

X5= Wind speed (Km/hrs.)

X6= Rainfall (mm)

X7= Bright sunshine hours (hrs.)

18)For the occurrence of canker incidence in Acid lime can be predicted in advance (before 15 Days) by following equation. The resulting negative value will indicate absence of disease and positive value will indicate possibility of occurrence of disease.

$$Y = 43.43 + 3.248X_1 - 5.543X_2 - 0.142X_3 + 2.526X_4 - 9.266X_5 - 3.057X_6 - 7.515X_7 - 2.770X_8$$

Where,

Y=Per cent canker incidence

X1= Maximum Temperature (°C)

X2= Minimum Temperature (°C)

X3= Morning Humidity (%)

X4= Evening Humidity (%)

X5= Wind speed (km/hrs)

X6= Rainfall (mm)

X7= Bright Sunshine (hrs.)

X8= Evaporation (mm)

19) For the control of powdery mildew of linseed two sprays of Propiconazole (0.1%) or Difenconazole (0.05%) or wettable sulphur (0.25 %) or Hexaconazole (0.1%) two spraying of any of these fungicides. One at disease initiation and second 15 days later is recommended.

Horticulture

20) For getting maximum profit better growth, yield and quality from Nagpur Mandarin application of 75% (900g:300g:300g) RDF + VAM 500g + PSB 100g + *Azospirillum* 100g + *T. harzianum* 100g per plant is recommended

21) For commercial propagation of cashew nut under Eastern Vidarbha zone, soft wood grafting in the first week of July is recommended.

22) Propagation by air-layering of Karonda, IBA 5000 ppm concentrated lanolin paste application is recommended.

23) The non-conventional crop *Dioscorea bulbifera* (Air potato) can be cultivated on commercial scale in Vidarbha region

24) The aonla syrup prepared by adding 25 per cent aonla pulp blended with 10 per cent lime juice and stored at cold storage is recommended with the acceptable score to 120 days and 90 days under ambient storage condition.

25) For quality flower stalk, more number of the florets, higher flower stalk and corm production with more monetary return Phule Ganesh variety of gladiolus is recommended in Vidarbha Region.

Medicinal Plant

26) The application of 20 t FYM along with NPK @ 100:50:50 kg per hectare (N in three splits) is recommended to *Piper longum* for obtaining higher fruits yield and monetary returns.

27) The plant spacing of 60 x 30 cm with the application of 2.5 t vermicompost per hectare is recommended to Aloe Vera for obtaining higher leaf yield and monetary returns.

Soil Water Conservation

28) In assured rainfall zone of Vidarbha region the life of the CCT's in sown silvipasture system is recommended upto 10 years.

29) For higher economical returns the double cropping system of Green gram-Chickpea and Soybean-Chickpea along with contour and across slope cultivation with protective irrigation by sprinkler irrigation from farm pond is recommended for the saline tract of purna river valley.

30) The rainfall intensity-duration-frequency (I-D-F) relationship developed for Gadchiroli, Chandrapur, Nagpur and Gondia station is recommended for determination of design rainfall intensity and a return period for flood control, rainwater harvesting and runoff.

<p>For Gadchiroli,</p> $I_{Gad} = \frac{5.7676 T^{0.186}}{(t - 0.27)^{0.753}}$	<p>For Chandrapur,</p> $I_C = \frac{5.8610 T^{0.1914}}{(t - 0.30)^{0.747}}$
<p>For Nagpur,</p> $I_N = \frac{6.6803 T^{0.1544}}{(t - 0.23)^{0.7688}}$	<p>For Gondia,</p> $I_{Ga} = \frac{5.2844 T^{0.1708}}{(t - 0.21)^{0.8072}}$

Where,

I = Rainfall intensity, cm/h; T = Return period, year
t = Duration, hour

31) In sub-mountain region of Maharashtra for determination of water storage capacity of bunding in agricultural watershed the following computerised based system is recommended.

- In agricultural watershed to predict the internal water storage in bunds- HEC-HMS model.

- To determine the supplementary water requirement of the crop and time of irrigation
- Optimization depending on linear programming

Post Harvest Technology

32) It is recommended to use process technology for powder from pumpkin and various value added products from it as well as cherry/tutty- fruity from pumpkin.

33) powder for instant *Ambil* preparation as well as sorgo papad viz *Sandoli* and *Bibadi*.

34) It is recommended to use process technology for ready to cook *Ambilis* recommended to use Intake of Poha Ladoo @ 100 gm/day to the tribal adolescent girls, continuously as a supplement for three months.

35) It is recommended to use process technology for value addition of onion and garlic by processing into quality powder, minced (chops) and kibbles (rings).

Agricultural Engineering.

36) It is recommended to use solar tunnel dryer (3X6X2m) for drying of turmeric slices & red chilli in minimal time and to maintain its quality

37) Soybean husk & sawdust (1:1) and groundnut shell & sawdust (1:1) of 8 to 10 % moisture is recommended to prepare good quality briquettes using piston press machine to conserve energy.

38) Dr. PDKV Automated Sprouter is recommended for sprouting of soybeans and for preparation of various products from sprouted soybean.

39) Dr. PDKV hand operated marking nut cracker is recommended for cracking of marking nut.

40) A pilot plant (100 kg/day capacity) developed by Dr. PDKV inclusive of Peeler, Cutter, Slicer and Cuber is recommended for preparation of cherry/tutty- fruity from pumpkin

41) It is recommended to use Dr. PDKV developed *Papad* cutter for cutting sorgo papad.

42) It is recommended to use drainage coefficients given in following table for designing agricultural drainage systems for different districts of Vidarbha region.

Name of crop	Basic infiltration rate (mm/hr)	Drainage coefficient (mm/day)								
		Amravati	Buldana	Washim	Yavatmal	Wardha	Gondia	Bhandara	Chandrapur	Nagchiroli
Vegetables	1	83.46	80.60	78.63	94.84	97.74	108.88	103.03	119.42	102.71
	2	59.46	56.60	54.63	70.84	73.74	84.88	79.03	95.42	78.71
	3	35.46	32.60	30.63	46.84	49.74	60.88	55.03	71.42	54.71
	4	11.46	8.60	6.63	22.84	25.74	36.88	31.03	47.42	30.71
	5	--	--	--	--	1.74	12.88	7.03	23.42	6.71
Oil seed crops	1	41.64	50.88	48.93	55.55	56.02	76.37	58.24	72.59	66.81
	2	17.64	26.88	24.93	31.55	32.02	52.37	34.24	48.59	42.81
	3	--	2.88	0.93	7.55	8.02	28.37	10.24	24.59	18.81
	4	--	--	--	--	--	4.37	--	0.59	--
Cotton, Sorghum, Maize, Bajra and other similar crops	1	26.09	37.49	30.59	34.27	34.71	54.31	45.22	52.01	48.29
	2	2.09	13.49	6.59	10.27	10.71	30.31	21.22	28.01	24.29
	3	--	--	--	--	--	6.31	--	4.01	0.29

Seed Technology

43) Pre-sowing hydro priming seed treatment for 8 hrs with 1:2 seed: water ratio followed by drying at room temperature to normal moisture content (10%) is recommended for expected and uniform field emergence, plant stand establishment and maximum seed production of pigeonpea

44)Seed treatment of polymer + flowable thiram @2.4 ml/kg of soybean seed before storage is recommended for maintaining the germination percentage above the minimum certification standards during storage of 12 months and higher yield.

45)It is recommended that for grading of paddy varieties a sieve of 1.4mm for fine and 1.6mm for coarse varieties may be used in place of presently recommended 1.8mm sieve

46)The specific gravity separator is recommended for removing the ODV seeds in paddy.

Bio Technology

47)It is recommended to use Java citronella oil as a botanical bactericide and fungicide at 14000 ppm dissolved in DMSO for the control of *Fusarium oxysporum* and most common pathogenic fungi and bacterial growth in the commercial banana tissue culture labs for production of contamination free seedlings.

Social sciences

48)The findings of the present study concludes that although majority of the gram growers possessed high level of knowledge about recommended package of practices of gram, however there exist a high level of technological adoption gap in improved practices like, seed treatment with biofertilisers, biofungicides and control measures for diseases. The major reason identified for existence of these high technological adoption gap from the present investigation are unavailability of bio fertilizers/biofungicides in the local market at the time of sowing. It could therefore be concluded that, there is wide scope to overcome these technological adoption gap in gram cultivation.

49)Hence, for avoiding the poor efficacy of herbicide technology on farmers' field it is recommended that the State Department of Agriculture should organize regular trainings/workshops, demonstrations and preparation of printed material about use of herbicides before sowing season with the expertise of SAU scientists so that soybean and cotton cultivators in Vidarbha will get technical knowledge for effective use of herbicides.

50)On the basis of this study it is hereby recommended that, there is need to provide subsidiary occupations by government to the farmers as land fragmentation had highest effect on farmer's distress and to give the remunerative

price for their agricultural produce on the basis of cost of cultivation. There is also need of social counselling and to provide agricultural technology and weather related information time to time to the farmers of Eastern Vidarbha Zone to overcome their distress situation.