Biodata of the Scientist

Division/Section:_Crop Production

A.Personal information

1.Name (With Title): V. Ravi

1.a. Qualification: M.Sc. Ph.D.

Designation: Principal Scientist

3. Address(Personal): Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram 695 017

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6. Countries visited: United Kingdom

B. Professional information

1. Area of specialization: Physiology of Tropical root and tuber crops

2. Area of interest: Abiotic Stress Physiology

3. Number of institute projects completed (Add list):

Sl. No.	Title of the Project
1.	Physiological response of Colocasia to drought stress
2.	Studies on rapid multiplication in Colocasia
3.	Investigation on physiological factors limiting yield potential in sweet potato
4.	Studies on drought management in cassava
5.	Studies on flowering in cassava
6.	Studies on production physiology of elephant foot yam

4. Number of Institute projects being handled (Add list):

Sl. No.	Title of the Project
1.	Abiotic stress management in tuber crops

5. Number of externally funded projects completed (Add list): Nil

6. Number of externally funded projects being handled (Add list): Nil

7. Number of students guided for a) Ph.D. Nil b) M. Phil Nil c) M.Sc 2

8. Number of students being guided for a) Ph.D Nil b) M.Phil Nil c) M.Sc Nil

8.a. information about the students under your guidance: Nil

9. Information on guide ship

Guide ship for Ph.D/ M.Phil/ M.Sc	University	Subject
PhD	Kerala University	Botany

10. Number of Research papers (Add list):

(i) Peer Reviewed Journal

(a) NATIONAL

1. **Ravi, V**. and G. Suja. 2012. Leaf area estimation in arrow root (*Maranta arundinacea* L.). J. Root Crops, 38: (No. 1), 60-63.

2. Nedunchezhiyan, M., G. Byju and **V. Ravi**. 2012. Photosynthesis, dry matter production and partitioning in cassava (*Manihot esculenta* Crantz) under partial shade of a coconut plantation. J. Root Crops, 38(2):116-125.

3. Sajeev, M.S., Sreekumar, J., **Ravi, V**., Jyothi, A.N. and Sheriff, J.T. 2011. Textural and rheological attributes of the tubers of some exotic cassava genotypes. J. Root Crops, 37(2): 174-182.

4. Ravi, V., Suja, G. and Ravindran, C.S. 2011. Method for leaf area determination in Chinese potato (*Plectranthus rotundifolius*). J. Root Crops, 37 (1): 37-40.

5. **Ravi**, **V**., Hridya, A.C., Suchitra, C.S. and Byju, G. 2011. Rapid method for determining total chlorophyll, chlorophyll a and b and carotene content in leaves of elephant foot yam using SPAD meter. J. Root Crops, **37**: 29-31.

6. **Ravi**, **V.,** James George, Latha, R., Murthy, B. S., Dharamraj, T., Ravindran, C. S. and Naskar, S. K. 2010. Effect of the annular solar eclipse of 15 Jan., 2010 on meteorological variables, photosynthetic electron transport and phosystem II efficiency of cassava. J. Root Crops 36 (1):72-77.

7. **Ravi**, **V.,** James George, Ravindran, C. S., Suja, G., Nedunchezhiyan, M., Byju, G. and Naskar, S. K. 2010. Method for leaf area determination in Elephant foot yam. J. Root Crops 36 (1):78-82.

8. **Ravi, V.,** Ravindran, C.S. and Suja, G. 2009. Growth and productivity of elephant foot yam. J. Root Crops 35 (1):131-142.

9. **Ravi**, **V**. 2005. Flowering and fruit set in some locally grown cassava genotypes. J. Root Crops. 31: 73-75.

10. **Ravi**, **V**., Santha V. Pillai, Ravindran, C. S. 2002. Starch yield of cassava under rainfed conditions of Thiruvananthapuram. Trends in Carbohydrate Chemistry 18: 165 – 170.

11. **Ravi, V**. and Vimala, B. 2001. Cambial activity and its relation to tuber growth in sweet potato. J. Root Crops, 27(1): 226-229.

12. **Ravi,V**. and Saravanan, R. 2001. Characteristics of photosynthesis and respiration in cassava and sweet potato. J. Root Crops 27(1):221-225.

13. **Ravi, V**. and Saravanan, R. 2001.Photosynthesis and productivity of cassava under water deficit stress and stress free conditions. J. Root Crops 27 (1): 230-234.

14. Mohankumar, C. R. and **Ravi, V**. 1999. Effect of preplanting treatments on sprouting of Amorphophallus. South Ind. Hort. 47: 284 – 287.

15. **Ravi, V**. and Saravanan, R. 1999. Proline metabolism and its relation to drought tolerance in sweet potato. J. Root Crops 25: 135-142.

16. Indira,P. and **Ravi, V**. 1997. Photosynthesis and photorespiration in cassava. Indian J. Plant Physiol. Biochem. 24: 18-21.

17. **Ravi, V**. and Chowdhury, S.R. 1997. Physiological response of taro to moisture stress. J. Root Crops 23: 63-66.

18. Chowdhury, S.R. and **Ravi, V**. 1996. Growth analysis of taro cultivars under rainfed conditions. J. Maharashtra Agric. Univ. 21:213-215.

19. **Ravi, V**. and Indira, P.1996. Anatomical studies on tuberization in sweet potato under water deficit stress and stress free conditions. J. Root Crops 22:105-111.

20. Chowdhury, S.R. and **Ravi, V**.1994. Characteristics of leaf area development in yams. J. Root Crops 20:96-100.

21. **Ravi, V**.1994. Effect of relative humidity on periderm formation and vascular streaking in injured cassava tubers. J. Root Crops 20:85-88.

22. **Ravi, V**. 1994. Respiration of intact and damaged sweet-potatoes at different temperatures and relative humidities. J. Root Crops 20:89-95.

23. **Ravi, V**. and Chowdhury, S.R.1993. Stomatal movements in the leaves of taro grown under different soil moisture regimes. J. Root Crops 19:1-7.

24. **Ravi, V**. and Chowdhury, S.R.1990. Growth and yield response of taro to different soil moisture regimes. J. Root Crops 17: 129 – 133.

25. Chowdhury, S.R. and **Ravi, V**.1990. Growth analysis of five sweet potato cultivars grown in summer under Bhubaneshwar conditions. J. Root Crops 17: 104 – 107.

26. Chowdhury, S.R. and **Ravi, V**.1990. Effect of clipping of vines on the biomass yield in sweet potato. J. Root Crops 16: 4 - 7.

27. **Ravi, V**. and Chowdhury, S.R. 1989. A method for leaf area determination in *Dioscorea*. J. Root Crops 15: 45 – 48.

(ii) INTERNATIONAL

1. Byju, G., M. Nedunchezhiyan, C. S. Ravindran, V. S. Santhosh Mithra, **V. Ravi** and S. K. Naskar. 2012. Modeling the response of cassava to fertilizers: A site-specific nutrient M,anagement approach for greater tuberous root yield. Communications in Soil Science and Plant Analysis, 43: (8), 1149-1162.
2. Byju, G., Ravindran, C.S., Nair, R.R. and **Ravi, V**. 2010. Tillage and planting methods on soil properties, yield, root rot and nutrient uptake in a continuously grown cassava field in a semi arid vertisol of India. Advances in Hort. Sci. (Italy), 24(3):176-182.

3. **Ravi**, **V**. and Ravindran, C. S. 2006. Effect of soil moisture and climate on flowering and fruit set in cassava (*Manihot esculenta*). Adv. Hort. Sci. (Italy) 20: 147-150.

4. **Ravi, V**. and Suryakumari, S. 2005. Novel technique to increase the shelf life of cassava stem stored for propagation. Adv. Hort. Sci. (Italy) 19: 123-129.

5. **Ravi, V.** and Ramanandam, G**.** 2004. Zero energy cool chamber technique to increase the shelf life of cassava stem stored for propagation. Bulgarian J. Agr. Sci. 10: 699 – 707.

6. **Ravi, V**. 2003. Diurnal changes in photosynthetic characteristics of sweet potato (*Ipomoea batatas*. L.). Adv. Hort. Sci. (Italy) 17:159-164.

(ii) REVIEWS
(a) NATIONAL

1. Ravindran, C.S., **Ravi, V.,** Nedunchezhiyan, M., James George and Naskar, S.K. 2011. Weed management in Tropical tuber crops. J. Root Crops 36- (2): 119-131.

2. **Ravi, V.**, Ravindran, C.S., and Suja, G. 2009. Growth and productivity of elephant foot yam. J. Root Crops 36- (2): 131-142.

3. **Ravi, V.,** S.K. Naskar, T. Makeshkumar, Binoy Babu and B.S. Prakash Krishnan. 2009. Molecular physiology of storage root formation and development in sweet potato. J. Root Crops, 35: 1-27.

4. **Ravi, V.,** Ravindran, C.S. and Ramesh, V. 2008. The impact of climate change on

photosynthesis and productivity of cassava and sweet potato: Effect of high CO_2, temperature and UV-B radiation. J. Root Crops, 34 (2): 1-13.

5. Mohankumar, C. R. and **Ravi**, **V**. 2002. Cassava based multiple cropping systems: A review. J. Root Crops 28: 1-13.

6. **Ravi, V**. and Nair, G.M. 1998. Cultural and phytosanitary measures to increase shelf life of cassava stems stored for propagation. J. Root Crops 24: 85-90.

(ii) INTERNATIONAL

1. **Ravi, V**., James George, Ravindran, C.S., Suja, G., Nedunchezhiyan, M., Byju, G. and Naskar, S.K. 2011. Crop physiology of elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson. Advances in Horticultural Sciences (Italy), 25: 51-63.

2. Ray, R. C. and **Ravi, V**. 2005. Postharvest spoilage of sweet potato in tropics and control measures. Critical Reviews in Food Science and Nutrition, (USA). 45: 623- 645.

3. **Ravi**, **V**. and Mohankumar, C. R.2004. Cassava based multiple cropping systems. Horticultural Reviews, (USA) 30: 355-500.

4. **Ravi, V**. and Indira P. 1999. Crop Physiology of Sweet potato. Horticultural Reviews (USA) 23: 277-338.

5. **Ravi, V**., Aked, J. and Balagopalan, C. 1996. Review on tropical root and tuber crops: I. Storage methods and quality changes. Critical Reviews in Food Science and Nutrition, **(USA)** 36: 661-709.

6. **Ravi, V**., Aked, J. 1996. Review on tropical root and tuber crops: II. Physiological disorders in freshly stored roots and tubers. Critical Reviews in Food Science and Nutrition, (USA) 36: 711-731.

(iii) PROCEEDINGS OF CONFERENCE / SEMINAR / SYMPOSIA ETC.

a. NATIONAL

1. Susan John, K., Ravindran, C.S. and **Ravi, V**. 2012. Cassava, A potential carbon sequestering food security crop for rainfed waste lands to mitigate global warming: Experience from a long term fertilizer experiment. In: Proceed. National Seminar on Watershed planning for Natural resources management. Kerala State land Use Board, Compendium of Selected Papers p. 155-158.

2. **Ravi, V.,** Ravindran, C.S. and Naskar, S.K. 2011. Cassava as a food crop under changing climate conditions. Opportunities and challenges. Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 78-83.

3. Naskar, S.K. and **Ravi, V**. 2011. Tropical root and tuber crops for food security under changing climate conditions in India. Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 35-40.

4. **Ravi**, **V.,** G. Suja, C.S. Ravindran and S.K. Naskar. 2011. Method for leaf area determination in *Plectranthus rotundifolius*, In: Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 334-338.

5. **Ravi**, **V**., A. C. Hridya, C.S. Suchitra and G. Byju. 2011. Rapid Method for determining total Chlorophyll, Chlorophyll a and b and carotene content in leaves of Elephant foot yam using SPAD meter. In: Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 325-327.

6. **Ravi**, **V**., A. C. Hridya, C.S. Suchitra, G. Byju, G. Suja and M. Manikandan. 2011. Nitrate reductase activity in leaves of tropical root and tuber crops. In: Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 253-255.

7. **Ravi**, **V.,** S. K. Naskar, C. S. Ravindran and James George. 2011. Use of vine cuttings as planting material for seed-tuber production in *Dioscorea*. In: Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 318-321.

8. Susan John, K., Ravindran, C.S., **Ravi, V.** and James George. 2011. Cassava a benign food security crop for carbon sequestration to mitigate global warming: Facts and figures from a long term fertilizer experiment. In: Proceed. National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. p. 90-93.

B. INTERNATIONAL

1. Nayar, T. V. R., Suja, G., Susan John, K. and **Ravi, V**. 2002. Cassava Agronomy in India – Low input management. In: VIIth Asian Cassava Research Workshop, Oct. 28 – Nov. 2002, Bangkok, Thailand. p. 183-203.

(IV) ABSTRACTS OF CONFERENCE / SEMINAR / SYMPOSIA ETC.

A. NATIONAL

1. **Ravi**, **V.,** G. Suja, C.S. Ravindran and S.K. Naskar. 2011. Method for leaf area determination in *Coleus forskholii* In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 126.

2. **Ravi**, **V**., A. C. Hridya, C.S. Suchitra and G. Byju. 2011. Rapid Method for determining total Chlorophyll, Chlorophyll a and b and carotene content in leaves of Elephant foot yam using SPAD meter. In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 122.

3. **Ravi**, **V**., A. C. Hridya, C.S. Suchitra, G. Byju, G. Suja and M. Manikandan. 2011. Nitrate reductase activity in leaves of tropical root and tuber crops. In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 124.

4. **Ravi**, **V.,** S. K. Naskar, C. S. Ravindran and James George. 2011. Use of vine cuttings as planting material for seed-tuber production in *Dioscorea*. In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 118-119

5. Susan John, K., Ravindran, C.S., **Ravi, V.** and James George. 2011. Cassava a benign food security crop for carbon sequestration to mitigate global warming: Facts and figures from a long term fertilizer experiment. In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 20-21.

6. Santha V. Pillai, Padmaja, G., Sheela, M.N., Susan John, K., Sajeev, M.S., Bala Nambisan, Jyothi, A.N., Jayaprakas, C.A., Vinayaka Hegde, **Ravi, V.** and Naskar, S.K. 2011. Selection of genetic stocks for economic characters from land races of cassava. In: National Seminar on Climate Change and Food Security, Indian Society of Root Crops, CTCRI, Trivandrum, 20-22, January. Abst. p. 77-78.

7. Santha V. Pillai., Nair, R. R., Palaniswami, M. S., Ravindran, C. S., Moorthy, S. N., **Ravi**, **V**., and Sreelekha, S. 2006. Evaluation and utilization of biodiversity in cassava. In: 2nd Nat. Plant Breed. Cong. 1-3 March, 2006, TNAU, Coimbatore.

8. **Ravi, V**. and Ravindran, C. S. 2005. Effect of soil drought and climate on flowering and fruit set in cassava (Manihot esculenta Crantz). In: Abstracts. LS 28. p. 48. Mangroves and coastal ecosystem XV Swadeshi Science Congress, Govt. Brennen College, Thalassery, 5-7 Nov., 2005.

9. **Ravi, V**., Shanta V. Pillai, and Ravindran, C. S. 2005. Genotype variation in productivity of cassava under drought stress. In: National Seminar on Strategies for improved farming and ecological security of Coastal region, Abstract No. CM-57, Page No. 56, Indian Society for Coastal Agricultural Research.

10. Indira , P. and **Ravi, V**. 1999. The carbohydrate partitioning in leaf, stem, and tuber during different stages of growth in cassava. Section III. Pp.291-297. In : Tropical Tuber Crops in food security and nutrition. (Balagopalan C. *et al*. Eds.) Oxford IBH Publishing Co. Pvt. Ltd., New Delhi.

11. **Ravi, V**. and Chowdhury, S.R. 1999. Rapid multiplication technique for dasheen taro. In: Tropical Tuber Crops in food security and nutrition. (Balagopalan C. *et al*. Eds.) Oxford IBH Publishing Co. Pvt. Ltd., New Delhi. pp. 367-371.

12. **Ravi, V**. and Chowdhury, S.R. 1996. Growth and Yield response of Colocasia accessions to drought stress. In: Tropical Tuber crops – Problems, Prospectives and Future Strategies, (Kurup, G.T. *et al*. Eds.) Section III. pp. 289-297.

13. Chowdhury, S.R. and **Ravi, V**. 1996. Changes in dry matter and Carbohydrate contents in three species of Dioscorea during sprouting under field condition. (Kurup, G.T. *et al*. Eds.) Section III. pp. 310-314. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

14. Chowdhury, S.R. and **Ravi, V**. 1994. Growth analysis of sweet potato varieties in Bhubaneswar under winter condition. In: Impact of Plant physiology on Indian Agriculture, 27-29 January, 1994, Agriculture College, Bapatla – 522 101, Andhra Pradesh (Abstract No. 28).

B. INTERNATIONAL

1. **Ravi, V**., Byju, G., Saravanan Raju and Hridya, A. C. 2011. Method for predicting corm yield per plant in elephant foot yam based on leaf morphological characters. In: Global Conference on Aroids: Opportunities and challenges, 23-25, January, 2012. Bhubaneswar. Abstarct: Misra, R.S. and Nedunchezhiyan, M. (Eds.), p. 39.

2. **Ravi, V**., Shanta V. Pillai, and Ravindran, C. S. 2006. Variation in productivity of cassava genotypes under drought stress. In: Abstract: Session VI. Biotic and Abiotic Stress, International Symposium on Tropical Tuber Crops, 20-26 Nov., 2006, CTCRI, Trivandrum, India, p. 169-170.

3. **Ravi, V**., Shantha V. Pillai, and C. S. Ravindran. 2003. Productivity of cassava under drought stress. In: 2nd International Congress of Plant Physiology on Sustainable Plant Productivity Under Changing Environment, 8-12 January, 2003, New Delhi, India. Abstract No. Session 4: S - 4 P113. p. 214.

4. Ravindran. C.S, Edison, S., Unnikrishnan, M., Anantharaman, M., **Ravi, V**., Makesh Kumar, T. and Vimala, B. 2003. Distribution of quality planting materials of tropical tuber crops in India. In Abstract of papers: Thirteenth Symposium of the International Society for Tropical Tuber Crops (ISTRC) 10-14, November 2003. AICC, Arusha, Tanzania.

5. Nayar, T. V. R., Suja, G., Susan John, K. and **Ravi, V**. 2002. Cassava Agronomy in India – Low input management. In: VIIth Asian Cassava Research Workshop, Oct. 28 – Nov. 2002, Bangkok, Thailand. Abstract Page No. 55.

6. Shantha V. Pillai, Nair, R. R., Sumarani, G. O. and **Ravi, V**. 2002. Germplasm management in cassava with special emphasis on core collection. In: International Conference on Vegetables. 11 – 14 Nov. 2002, Bangalore, Abstract No. I-21-O. p. 11 - 12.

7. Mohankumar, C. R. and **Ravi, V**. 2000. Commercial production of small corms in Amorphophallus. Session II. Soil and Crop Management In: International Symposium on Tropical Root and Tuber Crops, 19-22 January 2000, Central Tuber Crops Research Institute, Trivandrum, India, Abstract No.19, p. 51.

8. **Ravi, V**. and Saravanan, R. 2000. Photosynthesis and productivity of cassava under water deficit stress and stress free-conditions. Session II. Soil and Crop Management In:

International Symposium on Tropical root and Tuber Crops, 19-22 January 2000, Central Tuber Crops Research Institute, Trivandrum, India, Abstract, No. 43, p. 05.

9. **Ravi, V**. and Saravanan, R. 2000. Characteristics of photosynthesis and respiration in cassava and sweet potato. Session II. Soil and Crop Management In: International Symposium on Tropical root and Tuber Crops, 19-22 January 2000, Central Tuber Crops Research Institute, Trivandrum, India, Abstract No.32, p. 60.

10. **Ravi, V**. and Vimala, B. 2000. Cambial activity and its relation to tuber growth in sweet potato. Session II. Soil and Crop Management In: International Symposium on Tropical root and Tuber Crops, 19-22 January 2000, Central Tuber Crops Research Institute, Trivandrum, India, Abstract No.34, p. 61.

11. Number of Books/Book chapters(Add list):

(V) BOOK CHAPTERS

A. NATIONAL

1. **Ravi, V**. and Ravindran, C.S. 2010. Chapter 14: Impact of Climate change on cassava and sweet potato. In: Challenge of climate change: Indian Horticulture (H.P. Singh, J.P. Singh and S.S. Lal, (Eds.). Westville Publishing House, New Delhi-63, p. 104-112.

2. **Ravi, V**. 2008. The effect of Climate change on cassava and sweet potato. Chapter In: Impact Assessment of Climate Change for Research Priority Planning in Horticultural Crops. (S.S. Lal, P.M. Govindakrishnan, V.K. Dua, J.P. Singh, and S.k. Pandey (Eds.), Central Potato Research Institute (CPRI), Shimla, p. 159-174.

3. **Ravi, V.,** James George and Ramesh, V. 2008. Storage of planting materials of Tropical tuber crops. Chapter 19. In: Advance Techniques in Quality Planting Materials Production and Commercial Cultivation of Tropical Tuber Crops, Regional Centre of CTCRI (M. Nedunchezhiyan, (Ed.). p. 113-118..

12. Number of Technical Bulletins (Add list):

1. Production physiology of edible yams and eddoe taro.
2. Technologies for better crops: Yam bean, Coleus, Arrow root, Colocasia (Dasheen) and Xanthosoma.

13. Consultancies offered (Add list and give a brief description):Nil

14. Technologies developed (Add list and give a brief description):

1. Rapid multiplication technique for Yams

Developed a rapid multiplication technique using two node vine cuttings for production of seed tubers in three species of yams viz., *Dioscorea alata*, *D. rotundata* and *D. rotundata*. The

technique was found economically feasible and acceptable to farmers and is useful for production of disease free planting material from virus indexed plants.

2. Method for breaking dormancy in *Amorphophallus* corm for off-season commercial production

Developed a heat treatment technique by exposing the corm to 45^{o}C for 9 hr /day for 3 weeks induced early sprouting and thus enabling 30 days early planting of the crop which facilitates harvest by 30 days early than normal time. Thus, planting and harvesting can be advanced by 2 months per two crops and repeating the technique continuously for 3-4 years, year round production of small corms is possible. This technique combined with use of 125 -175 g planting material facilitates off-season commercial production of small corms of 1-1.5 kg size.

3. Developed low cost technique for storage of cassava stems (planting material)

In East Godhavari Dist. of Andhra Pradesh, cassava is planted in June and harvested between mid January and mid March and stored horizontally in bundles under the tree shade for a period of 3 to 5 months under hot and dry weather conditions. Under such conditions stems perish with a loss of 40-60%. Therefore, in order to extend the shelf-life of cassava stems, I (as PI) along with the co-PI developed a low cost **zero energy cool chamber** (ZECC) was at ARS Peddapuram to store cassava stems. By this method 60-70% of stems could be preserved in three varieties viz., *Sree Prakash*, *H-165* and *Sree Jaya*.

4. Technique developed for early flower induction in cassava

Some of the cassava genotypes do not readily flower for breeding purposes. Developed a technique to induce early flowering in cassava. By exposing cassava plants to day/night temperature of 19/15^{o}C, plants produced flowers and fruits at 5-6 months after planting as against 10 months under ambient conditions. This technique is useful for flower induction in cassava.

5. Rapid multiplication technique for dasheen taro (*Colocasia esculenta* var. *esculenta*)

In dasheen taro, 250 size of cut corms are used as planting material. I (as PI) developed microsett technique using apical and big size buds of 2.0-2.5 g for rapid multiplication of dasheen taro. In this method the multiplication ratio increased from 4 to 35 per 1 kg of tubers. The corm yield was 15 – 18 t ha^{-1} and on par with traditional method.

6. Clipping of shoot tips in sweet potato without affecting tuber yield

In sweet potato 15-20 cm shoot tips can be used as vegetable or planting material. Therefore, along with the PI I was involved in identifying the crop age upto which sweet potato shoot tips can be harvested without affecting tuber yield. It was found that sweet potato vine tips can be harvested at 30, 45 and 60 days without affecting tuber yield. This technology is useful for using

sweet potato vine cuttings as vegetable.

7. Identified drought tolerant genotypes in tuber crops

Identified 4 cassava promising genotypes viz., CE-54, CI-308, CI-848 (7 months duration) CI-534, (10 months duration), one variety Sree Bhadra and two genotypes in eddoe taro (*Colocasia esculenta* var. *antiquorum*) Aigenia Topi and Jangdi as tolerant to drought conditions.

8. Developed Technology for Management of tuber rot in cassava

Tuber rotting was a major constraint in Salem area of Tamil Nadu where cassava is largely cultivated. This was because of heavy soil and hard pan in this region. In a collaborative work On Farm Trials (OFTs) conducted at farmers field at Salem, Tamil Nadu revealed that chisel ploughing could increase the more uniform distribution of water and movement of soil organic carbon and total nitrogen to lower soil layers and uniform distribution of available N and K to the lower soil layers. This together with ridge ridge and furrow method of planting significantly reduced tuber rotting caused by the fungus Phytophthora.

9. Developed non-destructive method for estimating leaf area in *Dioscorea*, (yams) *Amorphophallus* (Elephant foot yam), *Plectranthus rotundifolius* (Chinese potato) and *Maranta* (Arrow Root). This method is now used by researchers working in these crops.

10. Developed non-destructive method for determining total chlorophyll, Chlorophyll a and Chlorophyll b and carotenoids content in the leaves of elephant foot yam using SPAD meter.

15. Patents/Copyrights obtained (Add list and give a brief description): Nil

16. Any other information: Nil