**A STUDY ON KNOWLEDGE AND ADOPTION OF TOMATO SEED PRODUCTION TECHNOLOGIES**

**Abstract:** The study on knowledge and adoption of tomato seed production technologies in Haveri district was conducted in 2023–24 using an *ex-post facto* research design. A sample of 120 tomato seed growers was selected from two talukas, each with two hoblies, with 30 growers randomly chosen from each hobli. The study assessed the knowledge and adoption levels of recommended tomato seed production technologies, highlighting key gaps and areas for improvement. Findings revealed that fundamental practices such as season selection, isolation requirements, staking, fertigation, drip irrigation and core seed extraction techniques were widely known and adopted. However, knowledge was significantly lower in areas like land requirements, transplanting methods and advanced disease and pest management. Adoption trends followed a similar pattern with higher adoption for essential agronomic practices, but lower for complex or resource-intensive ones such as herbicide application, organic manure usage and specific pest and disease control practices. The majority of growers were categorized as having medium (45.83 %) levels of knowledge and adoption (37.50 %), indicating a partial uptake of recommended technologies. These results suggest a pressing need for targeted capacity-building efforts. The study concludes that there is substantial potential to enhance tomato seed quality and yield through improved education, stronger extension services and better access to technical resources. Strategic interventions by seed companies su ch as establishing model demonstration farms, offering timely technical advisories and distributing comprehensive production guidelines are recommended to bridge the observed gaps in knowledge and adoption among growers.

**Key words:** Knowledge, Adoption, tomato, Seed growers

**Introduction**

Seed is a fundamental input in agriculture, playing a crucial role in determining the success of crop production. In recent decades, seed production has evolved from a traditional practice of saving farm-grown seeds to a highly specialized enterprise centered on producing and distributing high-quality seeds with desirable traits such as high yield potential, pest and disease resistance, drought tolerance and early maturity. Among vegetable crops, tomato (*Solanum lycopersicum*) is of particular significance due to its high economic value, nutritional content and versatility in both fresh and processed forms.

Tomato is the second most important vegetable crop in the world after potato and holds a similar position in India, where it is cultivated on approximately 8.40 lakh hectares with an annual production of 206.2 lakh tonnes. Karnataka, one of the leading tomato-producing states, accounts for 12.60 per cent of India’s total tomato production (Anon., 2023). Tomato is also recognised as a "protective food" due to its unique nutritional content. Tomatoes are high in vitamins A and C, as well as other minerals, which are essential for a variety of dishes such as sambar, soup, juice, chutney, pickles and ketchup. Tomatoes contain a high concentration of antioxidants, including phenolics, carotenoids (particularly lycopene and beta-carotene), vitamin C (ascorbic acid) and trace levels of vitamin E.

The growing demand for tomatoes has heightened the importance of producing superior quality tomato seeds, which directly influence crop productivity, resistance to biotic and abiotic stresses and overall profitability for farmers.

The production of quality tomato seed involves a sequence of scientifically guided practices, including maintenance of genetic purity, timely rouging, effective pest and disease control, post-harvest handling and seed storage. The efficiency and success of these practices are heavily dependent on the farmers’ knowledge and the degree to which these technologies are adopted in practice. While knowledge reflects the awareness and understanding of seed production protocols, adoption refers to the actual application of these practices in the field. Disparities between knowledge and adoption can significantly affect seed quality and, consequently, the yield and income of farmers.

The quality of tomato seeds has a direct impact on yield, disease resistance and overall agricultural sustainability. Understanding tomato seed growers knowledge and adoption trends is critical for optimising production procedures and ensuring consistent seed quality. This study intends to investigate the knowledge and adoption of tomato seed production technologies by tomato seed growers. This study was undertaken in the Haveri district of Karnataka, where there is considerable area under tomato seed production. The current investigation was developed with the following objectives.

1. To measure the knowledge of tomato seed production technologies
2. To measure the adoption of tomato seed production technologies by tomato seed growers

**METHODOLOGY**

The present study was conducted in Haveri district of Karnataka state. Considering the major tomato seed production area of Karnataka, the Haveri district was selected. Further two talukas in Haveri district were selected on the same basis. Further, from each selected taluka, two hoblies were selected, from each hobli, 30 tomato seed growers were randomly selected to constitute a total sample size of 120 respondents. The respondents were personally interviewed with an interview schedule. The data were tabulated and analyzed by using statistical tools like frequency, percentage, mean, standard deviation.

The main purpose of the study was to find out the knowledge and adoption of tomato seed production technologies in Haveri district. Since the event had already occurred, the *ex-post facto* research design was considered to be appropriate and the same was used for conducting the proposed study.

A list of knowledge and adoption items was prepared by discussing with experts from horticulture, agricultural extension education, seed science and technology and by referring to the package of practices of tomato cultivation recommended by University of Horticultural Sciences, Bagalkot, a total of 21 recommended production technologies were considered for the study. Respondents were asked questions to know whether they have knowledge about each of recommended practices in tomato seed production or not. Each known practice was scored "1" and not known practice was scored "0". The total score obtained by the respondents from all practices was the knowledge score of the individual respondent.

For adoption respondents were asked questions to know whether they have adopted each of recommended practices in tomato seed production fully, partially or not. Each fully adopted practice was scored "2", partially adopted practice was scored "1" and not adopted practice was scored "0". The total score obtained by the respondents from all practices was the adoption score of the individual respondent.

Based on the total score, the respondents were classified into three categories in both knowledge and adoption category by using mean and standard deviation as a measure of check.

**RESULTS AND DISCUSSIONS**

1. **Knowledge of tomato seed production technologies**

The data in table 1 indicates the universal knowledge of practices like the season for cultivation, isolation requirements, shade net usage, correct planting ratios, border rows, mulching, rouging and staking for protection among tomato seed growers is because these are fundamental practices essential for successful seed production. Additionally, their knowledge of fertigation methods and drip irrigation highlights the importance placed on efficient water and nutrient management, crucial for maximizing productivity in tomato seed production.

The lower level of knowledge regarding land requirements (63.33 %) and correct transplanting practices (60.00 %) among tomato seed growers may be due to the specific and technical nature of these practices. While basic seed production practices are well-known, land requirements and precise transplanting methods involve more detailed agronomic knowledge that may not be widely disseminated or understood.

The high awareness among respondents of the quantity of FYM application (73.33 %) and the recommended dose of fertilizer application (70.00 %) likely stems from the critical role these practices play in soil fertility and crop productivity. The universal awareness of hand weeding highlights its basic role in controlling weeds manually. The high awareness of recommended herbicide use (73.33 %) shows growers also value integrated weed management, combining manual and chemical methods.

The knowledge of disease management among tomato seed growers varied. Awareness was highest for powdery mildew control (80.00 %) and Fusarium wilt (73.33 %). About 65.83 per cent knew how to manage damping off and root rot and 63.33 per cent were aware of leaf curl management. Awareness droped for leaf spot (58.33 %), early blight (47.50 %), bacterial wilt (36.67 %) and root knot nematodes (16.67 %). The varying levels of knowledge about disease management among tomato seed growers reflect the relative prevalence and impact of each disease, as well as the focus of educational resources and extension services. Growers are generally more informed about diseases that are common or severe, such as powdery mildew and Fusarium wilt, due to their significant effects on yield and quality.

Regarding the knowledge of pest management, awareness was highest for whiteflies (95.83 %), followed by leafhoppers (92.50 %), aphids (91.67 %) and serpentine leaf miners (85.00 %). Awareness droped for tomato fruit borers (53.33 %) and leaf-eating caterpillars (46.67 %). The varying levels of knowledge about pest management among tomato seed growers reflect the prominence and severity of each pest, as well as the emphasis placed by educational programs and extension services.

The universal knowledge among respondents about practices like emasculation, pollen collection, pollination, harvesting, seed extraction methods and sun drying highlights the essential nature of these processes in tomato seed production.

However, the lower awareness of solar drying techniques (23.33 %) may be due to the fact that these methods being less commonly promoted in comparison to traditional sun drying, which is more familiar and widely practiced. Finally, the complete awareness of seed storage practices underscores the importance of proper storage in maintaining seed viability and quality, which is crucial for successful seed production.

The distribution of tomato seed growers according to overall knowledge (Table 1a) showed that 45.83 per cent of growers belonged to medium knowledge category followed by high (30.83 %) and low knowledge level (23.34 %). The possible reason for 45.83 per cent of tomato seed growers being in the medium knowledge category might be that many of these growers had higher education and substantial extension contact. This combination likely enhances their understanding of cultivation practices, leading to a moderate level of overall knowledge about the recommended production technologies.

1. **Adoption of tomato seed production technologies**

Table 2 shows that cent per cent adoption of the October-November planting season by tomato seed growers likely reflects its suitability for optimal seed production, possibly due to favourable weather conditions. In contrast, the lower full adoption (60.00 %) of the June-July season, with 33.33 per cent partially adopting it, might be due to less favourable growing conditions or the need to manage risks like monsoon-related challenges, leading some growers to only partially commit to this season.

The full adoption of key practices such as isolation requirements, mulching, rouging, staking, fertigation and drip irrigation by all respondents highlights their critical importance in ensuring high-quality seed production. These practices are essential for maintaining crop health, maximizing yield and meeting certification standards, which likely drives their universal adoption.

The majority (83.33 %) fully adopting the practice of avoiding Solanaceae crops in the previous season, with 16.67 per cent partially adopting it, suggests an awareness of crop rotation benefits, though some may face challenges like land constraints, leading to partial adoption.

The use of shade nets, fully adopted by 55.83 per cent and others were not. This variation was due to differences in farm size, investment capacity or perceived necessity based on local climate conditions.

The high adoption of transplanting practices i.e. fully (80.00 %), partially (20.00 %) and the recommended planting ratio fully adopted by 93.33 per cent, reflects their direct impact on plant growth and seed quality, with partial adoption likely due to situational constraints.

Large majority (90.00 %) fully adopting border rows emphasizes their role in protecting crops from external factors, with partial adoption possibly due to limited resources or space.

The lower adoption rate of organic manure application i.e. fully (20.00 %), partially (60.00 %) might be due to the practice of distributing FYM to other crops as well. Growers often allocate limited organic manure resources across multiple crops. In contrast, the higher adoption of recommended chemical fertilizer i.e. fully (65.00 %), partially (35.00 %) indicated that these were more readily accessible and easier to apply.

The complete adoption of hand weeding and low (7.50 %) adoption of use of herbicides could be attributed to their use of mulching, which effectively reduced weed appearance. As mulching minimizes weed growth, growers found it necessary to use hand weeding as a supplementary practice to manage any remaining weeds.

The recommended practice for managing damping off and root rot was adopted by 60.00 per cent of the growers. Half (50.00 %) of the tomato seed growers fully adopted the recommended treatments for controlling leaf curl disease, while the same (50.00 %) percentage partially adopted these methods. For early blight, 30.00 per cent of the growers fully adopted the recommended practice, with 46.67 per cent partially adopting it. The practice for Fusarium wilt management was adopted by 38.33 per cent of the respondents, with 35.00 per cent partially adopting it. In the case of leaf spot disease, 63.33 per cent of growers adopted the recommended practice. For powdery mildew, one third (33.33 %) of growers fully adopted the recommended spraying method, while 66.67 per cent partially adopted it. Lastly, the management practice for root knot nematode saw the lowest (17.50 %) adoption, partially adopting the recommended method. The varying adoption levels of disease management practices among tomato seed growers were shaped by factors such as the effectiveness and complexity of the practices, the visibility and severity of the disease, the availability of essential chemicals and the degree of technical guidance offered to the growers.

Regarding adoption of pest management, the recommended practice for managing serpentine leaf miners saw the highest adoption, with 75.83 per cent of the growers fully implementing the method and 24.17 per cent partially adopting it. For whitefly control, 71.67 per cent fully adopted the recommended spraying practices, while 28.33 per cent partially adopted them. The practice for managing leafhoppers was fully adopted by 60.00 per cent of the growers, with 40.00 per cent partially adopting it. In the case of aphids, nearly sixty per cent (59.17 %) of growers fully adopted the recommended spraying methods and 40.83 per cent partially adopted them. For tomato fruit borers, only 30.00 per cent fully adopted the recommended practices, while 20.00 per cent partially adopted them. Similarly, the management practice for leaf-eating caterpillars was fully adopted by 26.67 per cent of the respondents, with 17.50 per cent partially adopting it. The varying adoption levels of pest management practices among tomato seed growers were shaped by factors such as the effectiveness and complexity of the practices, the visibility and severity of the pests, the availability of essential chemicals and the degree of technical guidance offered to the growers.

The full adoption of practices such as emasculation, pollen collection, pollination, mature fruit harvesting, sun drying and seed storage (100.00 %) highlights their critical role in high-quality seed production. These fundamental practices are essential and readily implemented by all growers.

For seed extraction, the majority (55.83 %) preferred machine methods, likely due to their efficiency and availability. In contrast, 27.50 per cent of growers used both manual and machine methods, due to varying availability of equipment. Only 16.67 per cent used manual methods exclusively, which might be due to limited access to modern seed extractors.

The distribution of tomato seed growers according to overall adoption level (Table 2a) indicated that 37.50 per cent of growers belonged to medium adoption category followed by high (34.17 %) and low adoption level (28.33 %). Medium (37.50 %) adoption likely included growers integrating some recommended practices but facing challenges like cost or complexity. High (34.17 %) adoption comprised those with better access to resources and technical support, allowing full implementation of recommended practices. Their higher exposure to extension services and education enabled them to fully implement recommended practices.

**CONCLUSION**

Higher distribution of tomato seed growers in the medium level of knowledge and adoption category. Tomato seed growers are lacking in practices like land requirement, quantity of FYM application, recommended fertilizer dosage, disease and pest management which have significant impact on seed quality and yield. This implies that there is enough scope to promote and educate tomato seed production technologies by all concerned stakeholders. Seed companies should create an effective network of extension agents to provide ongoing support and guidance to seed growers. Additionally by establishing model farms where best practices are implemented, farmers can directly observe the benefits in person. Companies can enhance growers knowledge by providing timely advisory services on disease and pest management and distributing comprehensive tomato seed production guidelines literature.

**REFERENCES**

Anonymous, 2023, NABARD, Spiralling Tomato Prices: Issues and Concerns.

Chithra Y D, Meti S K, Bhawar R S and Maraddi G N, 2018, Knowledge level of pigeon pea seed growers about improved seed production technologies - A critical analysis. *International Journal of Current Microbiology and Applied Sciences*, 7(9): 876-884.

Dodia V P, 2014, Technological gap in adoption of castor seed production technology by the castor seed growers. *M.Sc. (Agri.) Thesis*, Anand Agricultural University, Gujarat (India).

Gaware K M, 2019, Entrepreneurial behaviour of onion seed producers. *M.Sc (Agri.) Thesis*, Dr.Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar, Akola (MS).

Ghagare S P, 2018 Impact of seed production training programme organized under RKVY project. *M.Sc. (Agri.) Thesis*, Dr.Panjabrao Deshmukh Krishi Vidyapeeth Akola (MS).

Khan, Mohammad Imran, Sharad Bisen and Gaurav Mahajan, 2020, Socio-economic profile of vegetable growers under horticulture-based module of farmer FIRST Project in Balaghat (MP), India.*International Journal of Current Microbiology and Applied Sciences,* 9(3): 3252-3257.

Kumar, Arvind, R K Doharey, Gaurav Kumar, Aman Verma, Atul Kumar Verma and Anurag Dixit, 2024, Socio-economic profile of onion growers of Kanpur Nagar of Uttar Pradesh, India. *Asian Journal of Agricultural Extension, Economics & Sociology,* 42(5): 323-332.

Mubeena, Lakshmi T, P L Praveena, A V Nagavani and Murthy B R, 2020, Profile characteristics of rural youth agripreneurs of Andhra Pradesh. *The Pharma Innovation Journal*, 9(6): 314-319.

Nagesh P N, 2005, Study on entrepreneurial behaviour of vegetable seed producing farmers of Haveri. *M.Sc (Agri.) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka, India.

Neeraj K, Godara A K, Malik A K, Kumar R, Dhayal B L and Jitarwal O P, 2021, Knowledge level of farmers about wheat seed production technology in Haryana. *The Pharma Innovation Journal*, 10(4): 129-131.

Patil R G, Gawande S A, Katole R T, Suryawanshi S N and Todasam P M. 2020. Extent of adoption of recommended cultivation practices of black gram. *Journal of Pharmacognosy and Phytochemistry,* 9(6): 181-184.

Pavithra B P, 2018, Study on knowledge and adoption of recommend cultivation practices by guava farmers. *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka.

Raghavendra R, 2005, Study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka*. M. Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka (India).

Rajshekar B, 2012, Innovative behaviour and diffusion of technology by awardee farmers in North Karnataka. *Ph.D. Thesis*. University of Agricultural Sciences, Dharwad.

Rashmi N, Chandrashekar, Vaster S, Kusumalatha D V and Manjunath K V, 2020, Constraints and suggestions of tomato growers in Chickballapur district of Karnataka*. International Journal of Current Microbiology and Applied Sciences*, 10: 723-728.

Sadvi P, 2015, A study on adoption of hybrid rice seed production in Karimnagar district of Telangana state. *M.Sc (Agri.) Thesis*, Professor Jayashankar Telangana State Agricultural University (Hyderabad).

Shinde P B, 2014, Knowledge and adoption of recommended seed production technology by the soybean growers in Parbhani district. *M.Sc. (Agri.) Thesis*, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharastra (India).

Tenzing P S, Rana P, Sharma P and Samriti, 2023, A study on socio-economic status of tomato growers in Solan district of Himachal Pradesh. *Asian Journal of Agricultural Extension, Economics & Sociology*, 41(3): 35-41.

Vijaylaxmi B S, Goudappa S B, Shashidhara K K, Basavegowda, Tulasiram J and Reddy B S, 2023, Profile of vegetable seed growers in Koppal district of Karnataka. *The Pharma Innovation Journal,* 12(4): 1439-1445.

Vishesh G and Syed H M, 2021, A study on the level of adoption in production practices of certified seeds by the respondents in selected crops (paddy, wheat). *International Journal of Current Microbiology and Applied Sciences*, 10(01): 3334-3338.

Vishwanath H P, 2017, A study on entrepreneurial behaviour of sericulturists in North Karnataka, *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka.

**Table 1. Knowledge of tomato seed growers about tomato seed production technologies**

| **Sl No.** | **Cultivation practices** | **Extent of knowledge** | |
| --- | --- | --- | --- |
| **f** | **%** |
| 1. | **Season**  (June-July, October-November) | 120 | 100.00 |
| 2 | **Land requirement**  **(**Previous season crop should not be tomato, chilly, brinjal or any other crops which are belong to Solanaceae family) | 76 | 63.33 |
| 3 | **Isolation requirement**  (100 m for hybrid seeds) | 120 | 100.00 |
| 4 | **Shade net** | 120 | 100.00 |
| 5 | **Transplanting**  **(**Should be done with the seedlings of 20-25 days old preferably at evening time. Spacing of 90x60 cm for female parent and 60x45 for male parent) | 72 | 60.00 |
| 6 | **Planting ratio**  (Female and male parents often sown in 2:1 ratio) | 120 | 100.00 |
| 7 | **Border rows** | 120 | 100.00 |
| 8 | **Mulching** | 120 | 100.00 |
| 9 | **Rouging** | 120 | 100.00 |
| 10 | **Protection**  (Staking) | 120 | 100.00 |
| 11 | **Organic manure application**  FYM at 35-38 tonnes/ha | 88 | 73.33 |
|
| 12 | **Fertilizer application**  **Recommended dose**  250:250:250 kg/ha | 84 | 70.00 |
| **Method of application** |  |  |
| Fertigation | 120 | 100.00 |
| 13 | **Method of irrigation** |  |  |
| Drip irrigation | 120 | 100.00 |
| 14 | **Weed management** |  |  |
| Hand weeding | 120 | 100.00 |
| Alachlor @ 1.5l/ha as preemergent spray | 88 | 73.33 |
| 15 | **Major diseases** |  |  |
| **a. Damping off and root rot** |  |  |
| Spray Zineb 75 WP or Mancozeb 75 WP @ 2g/l | 79 | 65.83 |
| **b. Leaf curl disease** |  |  |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | 76 | 63.33 |
| **c. Early blight** |  |  |
| Spray Dodine @ 3g/l or Mancozeb 2g/l or Cuprous oxide @ 2.5g/l (Two sprays at 15 days interval) | 57 | 47.50 |
| **d. Fusarium wilt** |  |  |
| Removal of affected plants, Drenching of Copper oxychloride @ 3g/l or Carbendazim @ 2g/l | 88 | 73.33 |
| **e. Root knot nematode** |  |  |
| Application of 3g Carbofuran granules per plant | 20 | 16.67 |
| **f. Leaf spot disease** |  |  |
| Spray Mancozeb 75 WP @ 2g/l after 8-10 weeks of transplanting | 70 | 58.33 |
| **g. Bacterial wilt disease** |  |  |
| Avoiding growing of tomato in bacterial wilt affected area | 44 | 36.67 |
| **h. Powderly mildew** |  |  |
| Spray Wettable sulfur @ 3g/l | 96 | 80.00 |
| 16 | **Major pests** |  |  |
| **a. Tomato fruit borer** |  |  |
| Collection and destruction of damaged fruits and grown-up caterpillars, Spray NPV or growing marigold as trap crop for every 25 rows of tomato | 64 | 53.33 |
| **b. Leaf eating caterpillar** |  |  |
| Destruction of pupae and Spray 5% neem seed extract kernal or Use poison baiting technique (25 kg rice or wheat bran+2 kg jaggery+125 ml Monocrotophos + 5l water) | 56 | 46.67 |
| **c. White fly** |  |  |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | 115 | 95.83 |
| **d. Serpentine leaf minor** |  |  |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | 102 | 85.00 |
| **e. Aphids** |  |  |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | 110 | 91.67 |
| **f. Leaf hopper** |  |  |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | 111 | 92.50 |
| **g. Root grub** |  |  |
| Soil application of Carbofuran 3G @ 20g/ha or soil spraying of Chloropyriphos @ 10ml/l | 11 | 9.16 |
| 17 | **Emasculation, pollen collection and pollination of emasculated plants** | 120 | 100.00 |
| 18 | **Harvesting**  **(**Fruits are harvested after full maturity of fruit when turn into red colour) | 120 | 100.00 |
| 19 | **Method of seed extraction** |  |  |
|  | Manual method of extraction | 120 | 100.00 |
| By using machine | 120 | 100.00 |
| 20 | **Seed drying** |  |  |
|  | Sun drying | 120 | 100.00 |
| Solar drying | 28 | 23.33 |
| 21 | **Seed storage** | 120 | 100.00 |

f – Frequency

% - Percentage

**Table 1a. Distribution of tomato seed growers according to overall knowledge**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No** | **Category** | **Frequency** | **Percentage** |
| **1** | Low (<31.74) | 28 | 23.34 |
| **2** | Medium (31.74-34.67) | 55 | 45.83 |
| **3** | High (>34.67) | 37 | 30.83 |
| **Mean = 33.20** | | **SD = 3.44** | |

**Table 2. Adoption of tomato seed production technologies by tomato seed growers**

| **Sl No.** | | **Cultivation practices** | **Adoption level** | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Fully Adopted** | **Partially Adopted** | | **Not adopted** |
| 1. | | **Season**  October-November | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| June-July | 72  (60.00) | 40  (33.33) | | 8  (6.67) |
| 2 | | **Land requirement**  **(**Previous season crop should not be tomato, chilly, brinjal or any other crops which are belong to Solanaceae family) | 100  (83.33) | 20  (16.67) | | 0 |
| 3 | | **Isolation requirement**  (100 m for hybrid seeds) | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| 4 | | **Shade net** | 67  (55.83) | 0  (0.00) | | 53  (44.17) |
| 5 | | **Transplanting**  **(**Should be done with the seedlings of 20-25 days old preferably at evening time. Spacing of 90x60 cm for female parent and 60x45 for male parent) | 96  (80.00) | 24  (20.00) | | 0  (0.00) |
| 6 | | **Planting ratio**  (Female and male parents often sown in 2:1 ratio) | 112  (93.33) | 8  (6.67) | | 0  (0.00) |
| 7 | | **Border rows** | 108  (90.00) | 12  (10.00) | | 0  (0.00) |
| 8 | | **Mulching** | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| **9** | | **Rouging** | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| 10 | | **Protection**  (Staking) | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| 11 | | **Organic manure application**  FYM at 35-38 tonnes/ha | 24  (20.00) | 72  (60.00) | | 24  (20.00) |
| 12 | | **Fertilizer application**  **Recommended dose**  250:250:250 kg/ha | 78  (65.00) | 42  (35.00) | | 0 |
| **Method of application** |  |  | |  |
| Fertigation | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| 13 | | **Method of irrigation** |  |  | |  |
| Drip irrigation | 120  (100.00) | 0  (0.00) | | 0  (0.00) |
| 14 | **Weed management** | |  |  |  | |
| Hand weeding | | 120  (100.00) | 0  (0.00) | 0  (0.00) | |
| Alachlor @ 1.5l/hac as pre-emergent spray | | 9  (7.50) | 83  (69.17) | 28  (23.33) | |
| 15 | **Major diseases** | |  |  |  | |
| **a. Damping off and root rot** | |  |  |  | |
| Spray Zineb 75 WP or Mancozeb 75 WP @ 2g/l | | 72  (60.00) | 20  (16.67) | 28  (23.33) | |
| **b. Leaf curl disease** | |  |  |  | |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | | 60  (50.00) | 60  (50.00) | 0  (0.00) | |
| **c. Early blight** | |  |  |  | |
| Spray Dodine @ 3g/l or Mancozeb 2g/l or Cuprous oxide @ 2.5g/l (Two sprays at 15 days interval) | | 36  (30.00) | 56  (46.67) | 28  (23.33) | |
| **d. Fusarium wilt** | |  |  |  | |
| Removal of affected plants, Drenching of Copper oxychloride @ 3g/l or Carbendazim @ 2g/l | | 46  (38.33) | 42  (35.00) | 32  (26.67) | |
| **e. Root knot nematode** | |  |  |  | |
| Application of 3g Carbofuran granules per plant | | 0  (0.00) | 21  (17.50) | 99  (82.50) | |
| **f. Leaf spot disease** | |  |  |  | |
| Spray Mancozeb 75 WP @ 2g/l after 8-10 weeks of transplantation | | 76  (63.33) | 14  (11.67) | 30  (25.00) | |
| **g. Bacterial wilt disease** | |  |  |  | |
| Avoiding growing of tomato in bacterial wilt affected area | | 20  (16.67) | 24  (20.00) | 76  (63.33) | |
| **h. Powderly mildew** | |  |  |  | |
| Spray Wettable sulfur @ 3g/l | | 40  (33.33) | 80  (66.67) | 0  (0.00) | |
| 16 | **Major pests** | |  |  |  | |
| **a. Tomato fruit borer** | |  |  |  | |
| Collection and destruction of damaged fruits and grown-up caterpillars, Spray NPV or growing marigold as trap crop for every 25 rows of tomato | | 36  (30.00) | 24  (20.00) | 60  (50.00) | |
| **b. Leaf eating caterpillar** | |  |  |  | |
| Destruction of pupae and Spray 5% neem seed extract kernal or Use poison baiting technique (25 kg rice or wheat bran+2 kg jaggery+125 ml Monocrotophos + 5l water) | | 32  (26.67) | 21  (17.50) | 67  (55.83) | |
|  | **c. White fly** | |  |  |  | |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | | 86  (71.67) | 34  (28.33) | 0  (0.00) | |
| **d. Serpentine leaf minor** | |  |  |  | |
| Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | | 91  (75.83) | 29  (24.17) | 0  (0.00) | |
|  | **e. Aphids** | |  |  |  | |
|  | Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | | 71  (59.17) | 49  (40.83) | 0  (0.00) | |
|  | **f. Leaf hopper** | |  |  |  | |
|  | Spraying of 0.5 ml Phosphamidon 95 WS or 1ml Oxydemethon-methyl 25 EC + 2ml Triazophos or 0.25ml Imidacloprid per litre of water or 4% neem seed kernal extract | | 72  (60.00) | 48  (40.00) | 0  (0.00) | |
| 17 | **Emasculation, pollen collection and pollination of emasculated plants** | | 120  (100.00) | 0  (0.00) | 0 | |
| 18 | **Harvesting**  **(**Fruits are harvested after full maturity of fruit when turn into red colour) | | 120  (100.00) | 0  (0.00) | 0  (0.00) | |
| 19 | **Method of seed extraction** | |  |  |  | |
|  | Manual method | | 20  (16.67) | 0  (0.00) | 0  (0.00) | |
|  | By using machine | | 67  (55.83) | 0  (0.00) | 0  (0.00) | |
|  | Manual and machine | | 33  (27.50) | 0  (0.00) | 0  (0.00) | |
| 20 | **Seed drying** | |  |  |  | |
|  | Sun drying | | 120  (100.00) | 0  (0.00) | 0  (0.00) | |
| 21 | **Seed storage** | | 120  (100.00) | 0  (0.00) | 0  (0.00) | |

f – Frequency

% - Percentage

**Table 2a. Distribution of tomato seed growers according to overall adoption level**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No** | **Category** | **Frequency** | **Percentage** |
| **1** | Low (<52.75) | 34 | 28.33 |
| **2** | Medium (52.75-59.04) | 45 | 37.50 |
| **3** | High (>59.04) | 41 | 34.17 |
| **Mean = 55.90** | | **SD = 7.38** | |