Chapter - II

REVIEW OF LITERATURE

Paulraj et al. (1982) reported the highest fruit yield of tomato as compared to the control on the application of 150:100:50 NPK kg/ha along with recommended dose of FYM @ 25 t/ha.

Mehta and Sani (1987) conducted a study on effect of NPK fertilizers on the plant growth, flowering and yield of tomato. The plants received basal FYM (20 t/ha) and N @ 75 – 125, P @ 60 – 90 or K @ 30 – 60 kg/ha. had significant on increased the fruit yield.

Bagal et al. (1989) studied the influence of different level of NPK fertilizers on the yield and quality of tomato and noticed the highest yield, acidity, TSS and lycopene content in tomato with the application of 200:100:100 kg NPK/ha along with recommended dose of FYM (20 t/ha).

Lacatus et al. (1994) studied the influence of organic and mineral fertilizers on tomato quality for processing. They revealed best quality of tomatoes for processing with N, P and K application rates of 300, 150 and 75 kg/ha, respectively, along with 20 t FYM/ha.

Kumaran et al. (1998) reported on the effect of organic and inorganic fertilizers on growth, yield and quality of tomato noticed the plant height (75.75 cm), mean fruit weight (41.05 g) and number of fruits per plant (18.30) were best with combination of FYM at 15 t/ha, 150:100:50 kg NPK/ha along with Azospirillum and phosphobacteria.

Renuka and Ravishankar (2001) conducted a study on the effect of organic manures on growth and yield of tomato, the application of biogas slurry + FYM, vermicompost + FYM and vermicompost alone have recorded maximum fruit size, more number of fruits per plant, while inorganic fertilizers (NPK) recorded the minimum fruit size. It is inferred that tomato crop would respond well to the application of organic manures either in combination with FYM or alone. Further, organic manures application helps to maintain good soil health.

Mohd et al. (2002) reported on the effect of organic and inorganic fertilizer on growth and yield of tomato, noticed the highest fruit weight, number of fruits per plant and the highest
Reddy et al. (2002) reported on the effect of nutrient sources on the fruit yield of tomato. A study was conducted to determine the effect of organic farming on tomato (cv. Marutham) production. Treatments comprised: 20 t farmyard manure (FYM)/ha (T1); 5 t vermicompost/ha (T2); 10 t FYM/ha + 2.5 t vermicompost/ha (T3); 50% N through FYM + 50% N through urea (T4); 50% N through vermicompost + 50% N through urea (T5); and recommended NPK rate (120:60:60 kg/ha) (T6). Treatment with T4 recorded the highest plant height (55.6 cm), number of branches per plant (7.4), number of fruits per plant (16.6), fruit weight (66.7 g) and yield (30.47 t/ha), A yield increase of 4.7% was observed with T4 treatment, indicating that the integrated application of organic manures along with inorganic fertilizers significantly increased the yield compared to organic or inorganic fertilizer applications alone.

Sainju et al. (2003) studied the mineral nutrition of tomato. Treatments comprised control, (100 N, 100 P, 150 K, 0 Mg and 0 B), (100 N, 100 P, 150 K, 1 Mg, and 0 B), (100 N, 100 P, 150 K, 0 Mg and 0.5 B) and (100 N, 100 P, 150 K, 1 Mg and 0.5 B) recorded the highest yield (97.5 t) per hectare were recorded in (100 N, 100 P, 150 K, 1 Mg and 0.5 B).

Julio et al. (2004) reported on the Chemical characterization of Nutribora compost and its combined use with a commercial fertilizer for the cultivation of tomato Nutribora compost is prepared with Eichhornia crassipes, cow manure and moriche [Mauritia] grove soil. This compost increased tomato production when used at an optimum dose of 80 t/ha. Treatments were 80 t Nutribora/ha + 0.4 t NPK/ha (12-24-12) in virgin soil fertilized with the compost for one year (T1); as T1 in soil without previous sowing or fertilizer (T2); 0.4 t NPK/ha in soil without previous sowing or treatment (C1); and 80 t Nutribora/ha in soil without previous sowing or treatment (C2). Two plant distances (0.20 and 0.40 m) were used. Tomato yields varied significantly between treatments, being largest with T1. Plant distance did not affect of crop yield.

Patil et al. (2004) reported on the effect of organic and inorganic fertilizers on the growth, yield and quality of tomato, the application of 50 % RFR + 50 % FYM resulted in the greatest

yield per plant (2.34 kg) and per hectare (586.51 q) were recorded in (50 % recommended dose of fertilizer + 50% FYM).
plant height (120.70 cm), number of fruit per plant (52.0), average fruit weight, yield per plant (2.34 kg) and T.S.S content (6.08)

Poul et al.(2004) reported on the effect of organic and inorganic nutrient sources on the growth, yield and nutrient uptake by tomato. The treatment 1/2 recommended dose, i.e. 50:25:25 NPK + 1/2 FYM + cow dung urine slurry (CDUS). Recorded the highest dry matter yield at 105 days after transplanting.

Yadav et al.(2004) conducted a study on the production of tomato under organic conditions to determine the suitable combination of organic manure with inorganic fertilizer to increase the tomato production. Treatments comprised: two levels of farmyard manure (FYM; 20 and 40 t/ha) alone or with one-half and full dose of recommended NPK (180:120:80 kg/ha), green manure (sunn hemp) alone and with one-half dose of recommended NPK on tomato hybrid ARTH-3. Application of FYM at 20 t/ha + full dose of NPK recorded the highest fruit yield (327.69 q/ha) with benefit: cost ratio of 1:1.49 and was at par with full dose of NPK alone. The lowest yield (113.5 q/ha) was observed in the treatment receiving only FYM at 20 t/ha. Slightly higher yield levels were obtained when the plants were supplied with FYM at 40 t/ha (184.66 q/ha) and green manuring (141.44 q/ha). The total soluble solids percent was highest (4.6%) upon treatment with 40 t FYM alone and lowest (3.5%) upon treatment with NPK alone. The maximum net return was obtained with full dose of NPK, followed by 20 t FYM + full dose of NPK, with cost:benefit ratios of 1:1.85 and 1:1.49, respectively.

Kumari and Sharma(2006) A study was carried out to determine the effects of boron, zinc, molybdenum, copper, iron and/or manganese, applied as foliar sprays, on the growth and fruit and seed yield of tomato. All the treatments were applied at 100 ppm starting 30 days after transplanting and repeated twice at 10-day interval. The recommended NPK rate (100 kg N, 75 kg P₂O₅ and 55 kg K₂O/ha) were uniformly applied in all the treatments including the control where no spraying of micronutrients was carried out. Variations in plant height, number of days taken to first flowering, number of branches per plant, number of fruits per plant, fruit yield per plant, yield/ha, seed yield and 1000-seed weight were observed. Foliar application of boron at 100 ppm resulted in the highest growth and seed yield, with net returns of Rs. 150 811.44/ha and cost: benefit ratio of 1:2.13.
Silspour and Omidghaemi (2006) conducted a study on the effects of different irrigation water quantities and use of Fe and Zn on yield and water use efficiency of tomato. Treatment comprise of three irrigation water regimes based on evaporation from pan class A (60, 80 and 100 percent evaporation) and four fertilizer treatments (NPK, NPKZn, NPKFe and NPKFeZn) in clay loam soil on tomato yield were studied, result showed that use of Zn and Fe increase yield and water use efficiency significantly. In general, use of NPK +Fe + Zn and irrigation based on 100 100% evaporation was best treatment with 48.1t/ha

Abdel-Mawgoud et al. (2007) studied on the responses of tomato plants to different rates of humic-based fertilizer and NPK fertilization. Field experiments were carried out to study the effects of Grow-Plex SP™ (a water soluble fertilizer with humic acid) in rates of (0, 60, 90 and 120 g/100 l of water) on tomato plants fertilized with different rates of chemical fertilizers of NPK (0, 50, 75 and 100% of recommended dosage). The data showed that the application of Grow-Plex SP™ in rates of 90 g/100 l with 75 and 100% NPK increased the number of leaves, fresh and dry weights of the plants. Total and marketable yield showed a similar positive trend with the same treatment. Data are further discussed in particular to the increment of endogenous hormonal levels, which possibly led to improvement in fruit production and quality.

Dhanasekaran and Bhuvaneswari (2007) conducted a study on the effect of different levels of NPK and foliar application of enriched humic substances on growth and yield of tomato. The treatments consisted of three levels of NPK (75%, 100%, 125% of recommended dose of NPK) and eleven sub-treatments which includes S0-control, S1-Humic acid (HA) 0.2%, S2-Polycarboxylic acid (PCA) 0.2%, S3-Naphthalene acetic acid (NAA) 50 ppm, S4-Micronutrient mixture, S5-HA+NAA, S6-PCA+NAA, S7-NAA+NM, S8-HA+NM, S9-PCA+NM, S10-HA+NM+NAA (enriched HA) and S11-PCA+NM++NAA (Enriched PCA). The sub-treatments were applied through foliar application. Tomato cv. S-22 was grown as test crop. The observation on growth, and yield attributes were recorded. The results revealed that foliar application of micronutrients and NAA enriched PCA to the plants supplied with 125% NPK recorded the highest fruit yield. Though foliar application of enriched PCA to the plants supplied with 100% NPK improved the yield at par with treatment receiving 125% NPK and enriched PCA foliar spray.
Kumari and Sharma (2007) reported on the effect of integrated nutrient management strategies in tomato production. Experiments were conducted to evaluate the effects of biofertilizers (Azotobacter, Azospirillum and Pseudomonas), applied alone or in combination with 75 and 100% doses of NPK (100, 75 and 55 kg/ha) and full dose of FYM (25 t/ha) on the growth and yield of tomato. Data was recorded for plant height, number of fruits per plant, fruit yield per plant, fruit yield per hectare and cost: benefit ratio. Application of Azotobacter in combination with 75 and 100% NPK and full dose of FYM 25 t/ha recorded the highest fruit yields and cost: benefit ratios.

Parry et al. (2007) studied on the physicochemical parameters and growth yield on tomato, role of FYM and Neemcake. This study evaluated the different FYM and Neemcake under different treatment levels of FYM (500, 1000 and 1500) g/plot, Neemcake (50 and 100) g/plot, the combination of FYM and Neemcake showed an increase in plant height, No. of leaves, No. of flowers, total yield, chlorophyll, ascorbic acid, lycopene content were enhanced compared to control.

Segura et al. (2007) studied on the Response of greenhouse tomato crop to NPK fertilization and quality of irrigation water. This work studies the effect of different nitrogen-phosphorous-potassium (NPK) dosages applied by fertigation and two types of irrigation water on tomato production under greenhouse conditions. The experiment was conducted on a greenhouse 'Pitenza' tomato crop, on a sand-mulched sandy loam soil and trickle irrigation. Two factors were considered: fertigation dosage and quality of irrigation water. Three NPK dosages, equivalent to 50, 100 and 200% of the crop uptake under the local conditions, were established, being the total N, P, K concentration of treatment 100% (40.1, 7.6 and 54.1 g m\(^{-2}\)) respectively. Two sources of water of different E.C. were also adopted (C.E.: 0.6 and 2.2 dS m\(^{-1}\)). The tomato crop showed a positive response to an increase of the nutrient solution NPK concentration, which raised the NPK extraction, yield and number of fruits per truss. An increase of the nutrient concentration from 100 to 200% produced a slight increase of yield (less than 10%), but lowered the nutrient uptake efficiency (27% for N, 44% for P and 34% for K).

Balemi (2008) reported the response of tomato cultivars differing in growth habit to nitrogen and phosphorus fertilizers and spacing. A field experiment was conducted during 2003/2004 and 2004/2005 cropping seasons to investigate the response of tomato cultivars
varying in growth habit to rates of Nitrogen (N) and Phosphorus (P) fertilizers and plant spacing. The treatment consisted of factorial combination of two cultivars (Margelobe and Melka shola), three NP fertilizers rates (50 kg N + 60 kg P$_2$O$_5$/ha, 80 kg N + 90 kg P$_2$O$_5$/ha and 110 kg N + 120 kg P$_2$O$_5$/ha) and three spacing (100 cm x 30 cm, 80 cm x 30 cm and 60 cm x 45 cm). Results revealed that fertilizer rates and spacing significantly affected the total and marketable fruit yields as well as % marketable fruit yield. Similarly, plant vigor (plant height), number of fruits per cluster and 10 fruit weight were significantly influenced by all of the main factors. Besides the main factors effect, fertilizer rate*spacing and cultivar*spacing interaction effects were also observed on % marketable fruit yield and 10 fruit weight, respectively. The results showed that the application of 110 kg N + 120 kg P$_2$O$_5$/ha or 80 kg N + 90 kg P$_2$O$_5$/ha resulted in significantly higher total as well as marketable fruit yield of the tomato cultivars. However, demonstrated that only the application the highest fertilizer rate (110 kg N + 120 kg P$_2$O$_5$/ha) resulted in superior fruit yields whilst the other two rates did not significantly differ from each other in affecting fruit yields. Results confirmed significantly higher % marketable fruit yield due to the application of either 110 kg N + 120 kg P$_2$O$_5$/ha or 80 kg N + 90 kg P$_2$O$_5$/ha. Closer spacing of 80 cm x 30 cm and 60 cm x 45 cm gave higher total as well as marketable fruit yield than the wider spacing of 100 cm x 30 cm.

**Jagadeesha (2008).** Studied the effect of organic manures and biofertilizers on plant growth, seed yield and quality parameters in tomato. The experiment consisted of 8 treatment combinations laid out in two factor randomized black design with three replication. revealed that the application of RDF (60:50:30 kg NPK/ha) + biofertilzier (Azospirillum and P solubilizing bacteria 2.5 kg/ha each) records higher plant height (64.37, 109.50 and 162.33 cm), number of leaves (92.50, 153.33 and 146.50), leaf area (898.05, 4314.31 and 4310.94 cm$^2$), followed by FYM (50%) + vermicompost (50%) + biofertilzier. The application of RDF + biofertilizers records higher seed yield (106.87 kg/ha) followed by FYM (50%)+ vermicompost (50%) (101.94 kg/ha) over FYM alone. The seed yield was significantly higher with the application of RDF + biofertilizers was attributed to number of fruits per plant (45.22) and fruit weight per plant (1280.98 g).

**Olaniyi and Ajibola (2008).** studied on the effects of inorganic and organic fertilizers application on the growth, fruit yield and quality of tomato (*Lycopersicon esculentum* Mill). The
treatments consisted of two levels of urea (0 and 60 kg N/ha) and five levels of poultry manure (0, 3.0, 4.5, 6.0, 7.5 t/ha). The growth parameters (plant height and number of leaves) showed increasing response as the amount of fertilizer applied increased. The combined application of the two types of fertilizers resulted in the highest marketable fruit yield.

Adekiya and Agbede (2009) reported on the growth and yield of tomato (Lycopersicon esculentum Mill) as influenced by poultry manure and NPK fertilizer. Four field trials were conducted to study the effect of poultry manure (PM), NPK 15-15-15 fertilizer and NPK 15-15-15 fertilizer + poultry manure on the growth and yield of tomato. Seven treatments were applied to the soil: 0, 10, 20, 30, 40 t ha$^{-1}$ poultry manure, 300 kg ha$^{-1}$ NPK 15-15-15 fertilizer and 150 kg ha$^{-1}$ NPK 15-15-15 fertilizer + 10 t ha$^{-1}$ poultry manure. The treatments were compared on the basis of their effect on soil chemical properties, leaf nutrient content, growth and yield of tomato. All levels of poultry manure and NPK 15-15-15 fertilizer + poultry manure increased leaf N, P, K, Ca and Mg levels. The soil chemical properties except pH increased with amount of poultry manure. NPK 15-15-15 fertilizer alone did not increase the soil and leaf Ca and Mg. All levels of poultry manure, NPK 15-15-15 fertilizer alone and NPK 15-15-15 fertilizer + poultry manure increased the number of leaves, plant height, leaf area, number of fruits and fruit weight significantly. Among poultry manure levels, 30 t ha$^{-1}$ poultry manure gave the highest fruit yield. Among the seven treatments, NPK 15-15-15 fertilizer + poultry manure gave the highest yield. On an average over the two years, 10, 20, 30, 40 t ha$^{-1}$ poultry manure, 300 kg ha$^{-1}$ NPK 15-15-15 fertilizer alone and 150 kg ha$^{-1}$ NPK 15-15-15 fertilizer + 10 t ha$^{-1}$ poultry manure treatments increased fruit weight. Results revealed that poultry manure is a suitable source of nutrients for tomato especially if applied at 30 t ha$^{-1}$. The combined use of NPK 15-15-15 fertilizer and poultry manure increased tomato yield compared to the application of NPK 15-15-15 fertilizer or poultry manure alone and is therefore recommended for sustainable productivity.

Hernandez et al. (2009) studied on the Nitrogen-potassium ratios to fertigate the protected tomato crop and its effect on biomass accumulation and nutrient uptake. The present study was carried out to evaluate the effect of nutrient solutions with different nitrogen/potassium fertigation ratios for protected tomato (HA-3019 hybrid) crop on biomass accumulation and macronutrient uptake within two planting times. Four N/K ratios (1:1.5; 1:2.0,
1:2.5 or production check, and 1:3.0) were studied in spring-summer season (March/July) and winter (September/January). Biomass accumulation (g.m$^{-2}$) and N, P, K, Ca and Mg consumption were determined per plant organ and total biomass (g.m$^{-2}$) for each treatment. In winter, dry weight and N, K and Ca uptake were significantly higher than in spring-summer season, whereas the top growing and nutrient consumption period corresponded to full production phase. The lowest leaf, stem and total biomass production corresponded to N/K ratio 1:1.5 in spring-summer; meanwhile dry fruit weight was significantly higher for N/K ratios 1:2.0 and 1:2.5. In winter season, significant fruit and total biomass values were recorded for N/K ratio 1:2.5 (production check); however, leave growth was similar in treatments 2, 3 and 4 (1:2.0, 1:2.5 and 1:3.0). Macronutrient extraction showed a similar behavior to that obtained for biomass accumulation.

Law-Ogbomo and Egharevba (2009) reported on the effect of planting density and NPK fertilizer application on yield and Yield Components of Tomato. The effect of planting density and NPK 15:15:15 fertilizer application on two cultivars were a study conducted to determine the optimum planting density and fertilizer rate. Roma VF 3900 and Roma VF 5-80-285 tomato cultivars were grown at three planting densities (33333, 41667 and 55555 plants per hectare) and three levels of NPK fertilizer (0, 200 and 400 kg/ha). The trials revealed that a combination of planting density and NPK 15:15:15 fertilizer application increased the productivity of tomato as they positively influenced the plant height at maturity, fruit yield and % marketable yield. The plots without fertilizer application had the least values in all the measured parameters. From the trials, a combination of 55555 plants per hectare and 400 kg NPK.ha$^{-1}$ gave the highest significant yield of 38.90 t. ha$^{-1}$ and 35 t. ha$^{-1}$ from Roma VF 3900 and Roma VF 5-80-285, respectively. The highest % marketable yield was also obtained from the same combination with both cultivars.

Akhtar et al. (2010) conducted a study on effect of potash application on yield and quality of tomato (Lycopersicon esculentum Mill.). A field experiment was conducted to evaluate comparative effects of sulphate and muriate of potash (SOP and MOP) application on yield, chemical composition and quality of tomato (Lycopersicon esculentum, M. cultivar Roma), from two sources i.e., MOP and SOP was applied @ 0, 100 and 200 kg K ha$^{-1}$ with constant dose of 200 kg N. ha$^{-1}$ and 65 kg P. ha$^{-1}$. A significant increase in tomato yield with K application was
observed. Potassium applied @ 100 kg K. ha\(^{-1}\) as MOP produced significantly higher marketable tomatoes as compared to SOP and control. Vitamin C contents in tomato fruits increased with K application in the form of MOP.

**Joshi and Pal (2010)** conducted a study on the effect of vermicompost on growth, yield and quality of tomato (*Lycopersicon esculentum* Mill). The treatments (control), VC15 (Soil+15% VC), VC30 (Soil+30% VC), VC45 (Soil+45% VC). Various growth and yield parameters like mean stem diameter, mean plant height, yield/plant, marketable yield/plant, mean leaf number and total plant biomass were recorded for each treatment. Various quality parameters like ascorbic acid, titrable acidity, soluble solids and insoluble solids were recorded for tomatoes from each treatment. Almost all the growth, yield and quality parameters increased significantly as compared to control.

**Ming et al. (2010)** reported on the Influence of organic and chemical fertilizers on tomato yield, quality, and the content of available heavy metals in tomato fruits and soil. Seven treatments including control (no fertilizer application), organic fertilizer, 80% organic fertilizer + NPK chemical fertilizer, 60% organic fertilizer + NPK chemical fertilizer, 40% organic fertilizer + NPK chemical fertilizer, 20% organic fertilizer + NPK chemical fertilizer, and NPK chemical fertilizer. The incorporated application of organic and chemical fertilizers significantly increased the tomato yield when the amount of applied nitrogen was equal. The highest total yield of tomato was obtained in the treatment with the ratio of organic and chemical fertilizer was 6:4, and the total yield increased by 15.6% compared with the control. The content of ascorbic acid was the highest in the organic fertilizer treatment. Comparatively, the fruit taste and nutritional quality of fruits were the best in organic fertilizer treatment.

**Salam et al. (2010)** The study was conducted to investigate the effects of boron and zinc in presence of different levels of NPK fertilizers on quality of tomato. There were twelve treatment combinations which comprised four levels of boron and zinc viz., i) 0 kg B + 0 kg Zn/ha, ii) 1.5 kg B + 2.0 kg Zn/ha, iii) 2.0 kg B + 4.0 kg Zn/ha, iv) 2.5 kg B + 6.0 kg Zn/ha and three levels of NPK fertilizers viz., i) 50% less than the recommended NPK fertilizer dose (50% <RD), ii) Recommended NPK fertilizer dose (RD), iii) 50% more than the recommended NPK fertilizer dose (50% >RD). The highest pulp weight, dry matter content, TSS, acidity, ascorbic
acid, lycopene content, chlorophyll a, chlorophyll-b, marketable fruits at 30 days after storage and shelf life were recorded with the combination of 2.5 kg B+ 6 kg Zn/ha and recommended dose of NPK fertilizers (N= 253, P= 90, and K= 125 kg/ha).

**Sathya et al.(2010)** reported on the effect of application of boron on growth, quality and fruit yield of PKM1 tomato. The field experiment was conducted to investigate the effect of application of boron on growth, quality and fruit yield of PKM1 tomato. The biometric characters such as plant height and number branches were significantly influenced by soil and foliar application of boron. It was observed that among the various levels of soil application of boron, borax @ 20 kg. ha$^{-1}$ was recorded increase in height and number of branches whereas among the various levels of foliar application of boron, 0.25 per cent borax spray produced taller plants with more No. of branches. The quality parameters of PKM1 tomato fruit such as lycopene, ascorbic acid, crude protein and total soluble sugars were significantly increased due to the soil application of borax @ 20 kg. ha$^{-1}$ recording a value of 3.99 mg. 100g$^{-1}$, 23.0 mg. 100g$^{-1}$, 10.13 per cent and 9.20° brix respectively. The results also revealed that the highest fruit yield of 33 t per hectare was recorded in treatment that received borax @ 20 kg. ha$^{-1}$ recording 33.6 per cent increase over control and was found to be significantly superior to rest of the treatments.

**Singh et al.(2010)** A field experiment was conducted with an objective to investigate the effects of vermicompost and NPK fertilizer application on morpho-physiological traits, yield and quality attributes of tomato (*Lycopersicum esculentum* Mill.) with an ultimate aim of optimizing nutrient requirements of tomato in mild-tropical agro-climate. The application of vermicompost together with NPK fertilizer increased plant height, leaf area, leaf weight, fruit weight, fruit yield, fruit density, post-harvest life and TSS of tomato. Present study reveals that application of vermicompost in the amount of 7.5 t/ha in combination with 50% dose of NPK fertilizer (60:30:30 kg/ha) was optimum for obtaining better quality and productivity of field grown tomatoes in mild-tropical agro-climate, eventually integrated nutrient supply will sustain the soil fertility and plant productivity eco-friendly.

**Arahunashi (2011)** studied on the influence of organics on growth, yield and quality of tomato (*Lycopersicum esculentum* Mill). Treatments include different organic sources of nutrients i.e.compost, FYM, green leaf manure, poultry manure, sheep manure and
vermicompost alone and their combinations compared with RDF alone and RDF+FYM. The morphological characters mainly total dry matter accumulation, plant height, number of branches, canopy spread, leaf area were significantly higher with RDF+FYM. The chlorophyll contents were higher with the application of RDF+FYM. The fresh fruit yield of tomato was found superior with the application of RDF+FYM. Net returns were significantly higher with RDF+FYM.

Chanda et al. (2011) conducted a study on the effect of vermicompost and other fertilizers on cultivation of tomato plants. Field trials were conducted using different fertilizers having equal concentration of nutrients to determine their impact on different growth parameters of tomato plants. Six types of experimental plots were prepared where T1 was kept as control and five others were treated by different category of fertilizers (T2-Chemical fertilizers, T3-Farm Yard Manure (FYM), T4-Vermicompost, T5 and T6-FYM supplemented with chemical fertilizers and vermicompost supplemented with chemical fertilizer respectively. The treatment plots (T6) showed 73% better yield of fruits than control, Besides, vermicompost supplemented with N.P.K treated plots (T5) displayed better results with regard to fresh weight of leaves, dry weight of leaves, dry weight of fruits, number of branches and number of fruits per plant from other fertilizers treated plants.

Irshad (2011) conducted a study on the effect of organic manures and inorganic fertilizers on biochemical constituents of tomato. In this study tomato plants were treated with organic manures (F.Y.M, Sewage sludge) and inorganic fertilizers (N.P.K, Zn, S) were analyzed for biochemical composition. T.S.S, lycopene, carbohydrate, vita. C, acidity,and carotenoid content exhibited an increase at all the test concentrations and were found maximum in sewage sludge treated along with N.P.K, followed by @ FYM along with NPK.

Kanwar (2011) studied on the Performance of tomato under greenhouse and open field conditions. The performance of five tomato genotypes was compared under polyhouse and open field conditions. The study revealed that the performance of all tested tomato genotypes is far superior in the polyhouse, as compared to open field conditions, for all the considered characters. 'Shivalik' performed best with respect to yield characters followed by 'Pusa Rohini' under polyhouse conditions. However, in the open field, 'Pusa Rohini' showed the highest values,
followed by 'Shivalik'. Cultivation of tomato under the polyhouse produced 136.12% more yield per ha and 188.93% more fruits per plant compared to open field cultivation.

Noor et al. (2011) reported on the integrated nutrient management for tomato-okra-indian spinach cropping pattern. In this study was conducted to find out a suitable combination of chemical fertilizers and organic manure for sustainable crop yield. There were 5 treatments comprising different percentages of the recommended chemical fertilizers (RCF) with two levels (0 and 5 t/ha) for tomato, An amount of 75% dose of RCF (N150 P40 K80 S20 Zn2 B1 kg/ha) along with poultry manure @ 5 t/ha appeared as the best suited combination providing tomato yield 95.3 t/ha and 88.2 t/ha for the first year and second year, respectively. Poultry manure performed better over cow dung. A package of 75% recommended chemical fertilizer along with 5 t PM/ha appeared as the best suited combination providing higher yield and economic return.

Prativa and Bhattarai (2011) conducted a study on the effect of Integrated Nutrient Management on the growth, Yield and Soil Nutrient Status in tomato \( (\text{Lycopersicon esculentum} \ L) \). The study revealed that the integration of organic manures in combination with inorganic fertilizers was found significant in improving the overall plant growth, yield and soil macro nutrient status than the sole application of either of these nutrients. Maximum plant height and number of leaves per plant were observed with treatment 16.66 mt/ha FYM + 8.33 mt/ha Vermicompost + NPK. Highest number of fruit clusters, maximum fruit weight and fruit yield were recorded in treatment 16.66 mt/ha FYM + 8.33 mt/ha Vermicompost + NPK.

Salam et al. (2011) The experiment was carried out to investigate the effect of boron, zinc, and cow dung on quality of tomato. There were 16 treatments comprising four rates of boron and zinc viz., \( B_1, Zn_0, B_{1.5}, Zn_2, B_2, Zn_4 \) and \( B_{2.5}, Zn_6 \) kg/ha and four rates of cowdung viz., \( CD_o, CD_{10}, CD_{15}, \) and CD20 t/ha. Every plot received 253 kg N, 90 kg P, 125 kg K, and 6.6 kg S per hectare. The results reflected that the highest pulp weight, dry matter content, ascorbic acid, lycopene content, chlorophyll-a, chlorophyll-b, marketable fruits at 30 days after storage and shelf life were recorded with the combination of \( @2.5 \) kg B/ha + 6 kg Zn/ha, and 20 t/ha cowdung.

Suge et al. (2011) reported on the effect of organic and inorganic sources of fertilizer on growth, yield and fruit quality of eggplant \( (\text{Solanum Melongena} \ L) \). The experiment aimed at evaluating the effect of combination between two levels of the recommended mineral
fertilizers (50% and 100% of research recommended rates) with three types of organic manures on growth, fruit yield and quality of egg plant (*Solanum melongena* L) var. black beauty. The experimental design was split plot design with three replications, where two levels of mineral fertilizers treatments (50% and 100%) were randomized in main plots while three types of organic manures (FYM, Compost and Tithonia) and control treatments were randomized in the subplots. Results showed the Soil fertilized with 100% recommended NPK combined with organic manures produced the superior growth of plants and the highest amount of total fruit yields. The promising combination was 100% of recommended NPK combined with farm yard manure produced the best response.

Meenakumari and Shekhar (2012) An experiment was conducted to determine the effect of vermicompost and other fertilizers on growth, yield and fruit quality of tomato in the field condition. The field trials were conducted using different fertilizers having equal concentration of nutrients to determine their impact on different growth parameters of tomato plants. Six types of experimental plots were prepared where T1 was kept as control and five others were treated by different category of fertilizers (T2-Chemical fertilizers, T3-Farm Yard Manure (FYM), T4-Vermicompost, T5 and T6- FYM supplemented with chemical fertilizers and vermicompost supplemented with chemical fertilizer respectively). The treatment plots (T6) showed 73% better yield of fruits, and dry weight of leaves, dry weight of fruits, number of branches and number of fruits per plant than control, followed by T5.

Naga et al. (2013) conducted a study on effect of Foliar Application of Micronutrients on Growth Parameters in Tomato (*Lycopersicon esculentum* Mill.). The treatments consisted of boron, zinc, molybdenum, copper, iron, manganese and mixture. All the Micronutrients except manganese at 50 ppm were applied at 100 ppm in three sprays at an interval of ten days starting from 30 days after transplanting. All the treatments resulted in improvement of plant growth characteristics viz. plant height, number of primary branches, compound leaves, tender and mature fruits per plant in both the varieties out of which application of micronutrients mixture showed the maximum effect. In tomato cv. UtkalKumari, maximum growth rate (85.7 %) was observed with application of zinc, followed by application of micronutrients mixture (78.2 %) and boron (77.5 %). Tomato cv. Utkal Raja, maximum increase in branches per plant was observed with the application of manganese (148.7 %), followed by micronutrient combination (144.1 %). In UtkalKumari, the fruit yield per plant ranged from 1.336 kg to 1.867 and in Utkal