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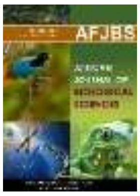

DIFFERENT GROWTH STAGES OF TOMATO (*Solanum lycopersicum*L.) HEEM SOHNA VARIETY AS IMPACTEDBY NPK FERTIGATION LEVELS, IRRIGATION LEVELS AND MULCHING DURING RABI GROWN UNDER POLY HOUSE CONDITION

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ABSTRACT

Under polyhouse environments, the study was carried out to evaluate a number growth phases of the tomato variety Heem Sohna (Solanum lycopersicum L) in relation to the NPK fertigation levels, irrigation levels, and mulching during the rabi growing season. During 2018- 2019, field trials were set up in naturally ventilated polyhouses. The tomato (Heem Sohna) produced the highest fresh fruit yield (153.37 t ha^{-1}) (15.34 kgm^{-2}) during Rabi 2018–19, when 100 RDF of the recommended fertilizer dose (150-60–80 kg $N–P_2O_5–K_2O$ $ha^{–1}$) was applied at irrigation level $I_{0.8}$ without any mulch. This was followed by the application of 150 RDF at irrigation level $I_{0.8}$ with mulch (146.40 t ha^{-1}, 14.64 kg m^{-2}). Under the poly house, there was no reaction to the mulch (25 microns, dual-colored, black and silver)

KEY WORDS: Tomato, Poly house, RDF, Irrigation, Mulches, Fertilizers, Fertigation

INTRODUCTION

Among vegetable crops, the tomato (*Solanum lycopersicum* L.), which is the most consumed member of the Solanaceae family. Due to its many applications, flavor, color, and high nutritional content, It is among the most significant vegetable crops in the world (Rathore *et al.*, 2021). Being a warm-season tropical crop, tomatoes are not particularly responsive to changing environmental factors. Crop productivity is adversely affected when grown in open fields since it is subjected to varying temperatures, humidity levels, wind directions, *etc.* (Sanwal *et al.* 2008). As a result, farmers are unable to choose to grow input alongside delicate and extremely profitable income crops like vegetables. Farmers are forced to plant a single crop with low production each year due to extreme weather events. Therefore, protected farming has emerged as the ideal choice for efficiently using land as well as additional resources in the current environment of declining land holdings combined with noticeable changes in weather and temperature.

MATERIALS AND METHODS

The current investigation has taken place during , rabi 2018-19, at Horticulture Farm, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad - Telangana, India. The preliminary soils of the investigational site were Red sandy loam with a texture that has pH-8.03, EC (dS/m)-0.18, organic carbon 0.03 % with low in available nitrogen (137.98kg ha^{-1}), medium in available phosphorous (142.68kg ha^{-1}) and very high in available potassium (390.88 kg ha^{-1}). The trial was laid out in Complete Ramdazied Design (CRD) treatments 12 with 3 replication. Bed sizes (Width x length) 0.6 x 24 m (14.4 m^2), Space between the beds – 0.4 m, Fertilizers: Urea, Urea phosphate (17-44-0), white MOP. The lateral spacing of drips: 1.2 m, Dripper spacing: 0.4m, Discharge rate: 4 lph. The treatments includes Fertigation levels – Three levels *viz* (F100-100 % Recommended NPK (150-60-80 kg N-P_2O_5-K_2O ha^{-1}), F125 - 125 % Recommended NPK(187.5-75-100 kg N-P_2O_5-K_2O ha^{-1}), F150– 150% Recommended NPK (225-90-120 kg N-P_2O_5-K_2O ha^{-1}). Irrigation levels with and without mulch: Four ($I_{0.6}$ – Irrigation at 0.6 Epan , $I_{0.6}$ – Irrigation at 0.6 Epan + mulch, $I_{0.8}$ – irrigation at 0.6 E pan, $I_{0.8}$ – irrigation at 0.8 E pan + mulch). The Plastic mulch, 25 microns, dual coloured black and silver. Fertigation interval – three days.

	pH (1:2.5)	**EC (dS/m) (1:2.5)**	**Organic carbon (%)**	**Available N (kg ha^{-1})**	**Available P (kg ha^{-1})**	**Available K (kg ha^{-1})**
Poly house	8.03	0.18	0.03 (Low)	137.98 (Low)	142.68 (high)	390.88 (high)

*Initial soil samples

The playhouse, which was naturally ventilated, was orientated north-south and coated with 200 micron-thick UV-stabilized LDPE film for cladding. On the raised beds, the vigorous and uniform tomato seedlings, four weeks old, were transplanted at a distance of 60 cm by 50 cm. As stated by the treatment plan, fertilization began via an automatic fertilization unit 12 days after transplantation. Water soluble fertilizer sources such as urea (46%), urea phosphate (17-44-0), and potash muriate (60%) were used for the fertigation process. Every plant protection measure and agronomic technique was implemented in accordance with recommendations. NPK grade of 19:19:19) and urea (46.6% N). Every plant protection measure and agronomic technique was implemented in accordance with recommendations.

Percentage of nutrients planned for application at different growth stages of tomato:

DAT	**Duration (days)**	**Dose (% of total)**		
		N	**P_2O_5**	**K_2O**
0-35	35	14.0	24.0	8.00
36-50	15	8.0	7.0	7.00
51-60	10	7.0	6.0	8.00
61-140	80	71.0	63.0	77.00
Total		100.0	100.0	100.00

Observations on different growth parameters viz., plant height (cm), chlorophyll (SPAD meter readings), leaf area index, number of days for flower initiation, number of fruits, and fresh fruit yield (kgm^{-2} and ha^{-1}) were taken from five plants selected at random for each treatment.

RESULTS AND DISCUSSION

The study examined growth-specific data, particularly plant height (Table 1), and found that varying fertigation levels and schedules had an important effect. When NPK was applied more frequently and the fertigation level was raised, these parameters performed better. After 120 days of transplanting, the irrigation of 100 RDF with 0.8 E.pan without mulch (F_{100} $I_{0.8}$ M_0) produced a noticeably higher plant height (231.93 cm) among the fertigation levels. On the other hand, during 120 days of transplanting, the minimal plant height was noted in the fertigation of (T6) F_{125} $I_{0.6}$ M_1. This may be the result of fertigation providing the plant root zone with a higher supply of potassium, phosphorus, and nitrogen.

This satisfies the crop's nutritional needs and is bolstered by the crop's maximum capacity to absorb moisture and nutrients, which speeds up the plant's metabolic processes and promotes increased cell growth. Protein synthesis, assimilate translocation, and photosynthetic activities all increase with higher fertigation levels (53 fertigation), and these findings are consistent with those of Kavita *et al.* (2007) and Brahma *et al.* (2009). Fertigation facilitates more effective irrigation and fertilizer use while decreasing application costs.

It reduces nutrient losses and enhances plant growth and uptake of nutrients (Anonymous, 2005).

Different irrigation and fertigation quantities was no noticeable impact on the content of chlorophyll.

The highest leaf area index (2.9 dm^{-2}) was recorded (Table.1) thirty days after transplanting when 100% RDF irrigation at 0.6 E.pan with mulch (F_{100} $I_{0.6}$ M_1) was fertigated; The parameters' lowest values were noted, with fertigation of F_{125} I $_{0.6}$ M_1 (1.5 dm^{-2}). This may also be because the playhouse favorable microclimatic conditions, which improved photosynthesis and respiration, led to an increase in these attributes. These results coincided with the findings of Feleafel and Mirdad (2013) and Yasser *et al*. (2009).

The required number of days to start first and 50% flowering were recorded (38 days) in 100% RDF with 0.8 Evaporation (I $_{0.8}$) without mulch (M_0) and the higher days (42.7 days) taken for first flowering treatment of 125% RDF with 0.8 Evaporation (I $_{0.8}$) with mulch (M_0) can be examined in light of the fact that fertigation promotes early flowering and plays a significant role in plant metabolism as a necessary component of many different types of metabolically active compounds, including prophytins, amino acids, proteins, nucleic acids, nucleotides, and co-enzymes.(Shree *et al.,* 2018).

The tomato fruit yield (Table 1) was significantly influenced by different fertigation and irrigation schedules and showed that fertigation of NPK at every 3 days interval upto 120 days after The yield of fruit increased considerably after transplantation were recorder in (15.33 Kg m^{-2} and 153.37 t ha^{-1}). The lowest fruit yield were recorded (12.42 Kg m^{-2} and 124.20 t ha^{-1}) in 100% RDF with Irrigation 0.8 Evaporation (I $_{0.8}$) with mulch (M_1). This could be because during the crop growth period, sufficient amounts of nutrients were frequently applied directly to the root zone, improving nutrient effectiveness and consequently the growth and yield characteristics of tomatoes (Singh et al., 2013).

CONCLUSIONS

Increased crop growth and yield were the result of the T3 treatment's utilization of nutrients and irrigation throughout the crop growth period (100% RDF irrigation, 0.8 evaporation, no mulch), which allowed for maximum nutrient absorption and water's synergistic flourishing of photosynthetic parts translocation.

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(Table-1):- Tomato (Heem Sohna) plant height (cm), chlorophyll (SPAD meter readings), LAI, No. of days for flower initiation, No. of fruits and fresh fruit yield (kg m^{-2} and ha^{-1}) at different stages of growth as influenced by NPK fertigation levels, irrigation levels and mulching during Rabi 2018-19 grown under Poly house condition.

Treatments	Plant height (cm)				Chlorophyll (SPAD meter readings)				LAI (dm^{-2})				No. of days for Flower Initiation	Yield	
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT		Yield (Kg m^{-2})	Yield (t ha^{-1})
F_{100} $I_{0.6}$ M_0	45.11	138.97	187.85	209.65	41.6	58.2	52.5	38.27	1.9	2.1	1.75	1.01	38.3	13.17	131.73
F_{100} $I_{0.6}$ M_1	45.05	154.05	172.67	205.68	38.8	60.6	52.0	42.80	2.9	2.8	2.62	0.92	39.3	13.49	134.98
F_{100} $I_{0.8}$ M_0	42.35	157.27	208.96	231.93	36.5	52.4	46.1	37.93	2.6	2.6	2.42	0.97	38.0	15.33	153.37
$F_{100}I_{0.8}$ M_1	48.98	156.11	204.69	222.99	43.5	48.7	47.5	42.97	2.4	2.6	2.48	0.97	40.0	12.42	124.20
F_{125} $I_{0.6}$ M_0	42.96	147.21	178.98	207.68	37.0	58.3	54.3	37.79	2.2	2.0	1.83	0.92	38.0	13.23	132.38
F_{125} $I_{0.6}$ M_1	42.07	154.00	157.48	190.13	38.2	49.3	43.4	35.14	1.5	1.7	1.45	0.95	40.7	13.70	137.04
F_{125} $I_{0.8}$ M_0	45.28	141.20	193.89	217.95	36.9	55.0	50.0	36.87	2.0	2.2	1.85	0.94	42.7	14.04	140.40
F_{125} $I_{0.8}$ M_1	46.41	147.91	178.92	208.46	36.2	50.4	47.9	35.76	2.1	2.0	1.72	1.35	38.0	13.33	133.36
F_{150} $I_{0.6}$ M_0	47.13	146.86	182.60	207.40	37.6	53.4	50.1	35.53	2.1	2.0	1.78	1.30	38.0	13.84	138.46
F_{150} $I_{0.6}$ M_1	45.51	156.88	151.16	191.04	55.8	46.9	46.5	40.07	2.4	2.5	2.28	1.35	40.3	13.19	131.93
F_{150} $I_{0.8}$ M_0	45.57	149.61	182.86	210.13	43.7	47.5	47.4	38.77	2.6	2.7	2.31	1.27	39.3	13.24	132.40
F_{150} $I_{0.8}$ M_1	47.74	149.57	184.12	206.80	44.6	51.0	52.3	35.33	2.9	2.7	2.18	1.33	38.3	14.64	146.40
S.E+/_	1.39	6.38	2.64	3.74	5.43	4.66	4.31	3.59	0.50	0.28	0.25	0.20	1.25	0.99	9.98
C.D(P= 0.05)	2.89	NS	5.48	3.10	NS	NS	NS	NS	NS	0.59	0.52	NS	2.60	NS	NS