Effect of different dosages and scheduling time of plant growth regulators and time of application of defoliators on growth and yield of *Bt* cotton (*Gossypium hirsutum* L.) under high density planting system (HDPS).

ABSTRACT: A field trial was conducted at Regional agricultural research station (RARS), Warangal during *kharif*-2022. The experiment consisted of totally eleven treatments which was laid out in Randomized block design (RBD) with three replications. The treatment details are T_1: Application of Mepiquat chloride (MC) 25g a.i ha^{-1} @40&55 DAE+ Etherel 2000ppm @40% boll burst, T_2: MC 25 g a.i ha^{-1} @40&55 DAE+ Etherel 2000ppm @60% boll burst, T_3: MC 20g a.i ha^{-1} @40DAE, MC 30g a.i ha^{-1} @60DAE+ Etherel 2000ppm@ 40% boll burst T_4: MC 20g a.i ha^{-1} @40DAE, MC 30g a.i ha^{-1} @60DAE+ Etherel 2000ppm@ 60% boll burst T_5: MC 20 g a.i ha^{-1} @40,55 & 75 DAE+ Etherel 2000ppm @40% boll burst, T_6: MC 20 g a.i ha^{-1} @40,55 & 75 DAE+ Etherel 2000ppm @40% boll burst, T_7: MC 25 g a.i ha^{-1} @4 0,55 & 75 DAE+ Etherel 2000ppm @40% boll burst, T_8: MC 25 g a.i ha^{-1} @40,55 & 75 DAE+ Etherel 2000ppm @60% boll burst, T_9: 20g a.i ha^{-1}@ 40DAE, 25g a.i ha^{-1}@55DAE & 30g a.i ha^{-1}@70DAE +Etherel 2000ppm@ 40% boll burst, T_{10}: 20g a.i ha^{-1}@ 40DAE, 25g a.i ha^{-1}@55DAE & 30g a.i ha^{-1}@70DAE +Etherel 2000ppm@ 60% boll burst, T_{11}: Control. The result of present study revealed that foliar application of MC @ 20 g a.i ha^{-1}@ 40,55 & 70DAE in conjunction with Etherel 2000ppm @60% boll burst resulted in significantly higher seed cotton yield. Whereas other parameters like plant growth, drymatter accumulation and stalk yield were recorded highest in control plot and lowest with spraying of : 20g a.i ha^{-1}@ 40DAE, 25g a.i ha^{-1}@55DAE & 30g a.i ha^{-1}@70DAE +Etherel 2000ppm@ 40% boll burst. Among Mepiquat chloride treatments with similar doses, all the agronomic traits of cotton crop are positively influenced with application of 2000ppm of etherel @60% boll burst.

Key words: *Gossypium hirsutum*, Plant growth regulators, Mepiquat chloride, Defoliators, Dry matter production, Etherel.

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is a important cash crop of the world. Because of its grate contribution to Indian agriculture in terms of employment generation, industrial development and national economy it is called as “King of fibres” (Uma and Murali 2019)

According to 2021-22 data global area under cotton is 32.7 million ha with production of 121.6 million bales, where each bale weighs 217.72 kgs. (www.pjtsau.edu.in cotton outlook January-2022). During 2021-22 in India the cotton area, production and productivity projected as 12,371 thousand ha, 31,117 thousand bales of each 170 kgs, 428 kg ha^{-1}. (www.indiastat.com). In Telangana in 2021-22 it was recorded that area under cotton is 18.89 Lakh ha, Production of cotton is 48.78 Lakh bales and Productivity of 439 kg ha^{-1}. (www.aiccip.cicr.org.in). In Telangana, Nalgonda is leading district with area of 294074.18 ha under cotton cultivation.

Cotton progress depends on environment and seasonal practices, impacting growth, development, and yield. Maximizing cotton yield involves adjusting plant density per unit area, but it varies with cultivars used. Optimal plant spacing plays a pivotal role in adjusting plant density to enhance cotton productivity, particularly under irrigated conditions.(Zaman *et al* ., 2021)

High density planting system (HDPS) of cotton is a method of cultivation, where the space between the rows and plants in a row is decreased in order to increase number of plants per unit area, which will result in more number of bolls per unit area and subsequent increase in yield. But the problem with HDPS is over crowding of plants causing excessively taller height, more vegetative growth, mutual shading which may intern leads to reduction in yield.(Priyanka *et al*., 2021) Thus plant

growth regulators has to be applied to HDPS cotton which will reduce the plant height of cotton and helps in increasing productivity and profitability of the HDPS cotton.

Mepiquat chloride (1,1-dimethyl-piperidinium chloride), a common plant growth regulator, is extensively employed to control cotton growth structure, modulate plant growth, and expedite maturation in conditions of high planting densities. (Stuart *et al*., 1984). The application of growth regulators led to dose-dependent reductions in plant height, decreased height to node ratio, increased boll weight, and delayed maturity. Mepiquat chloride enhanced compactness and reduced nodes. (Reddy *et al*., 1990). Environmental factors, notably temperature impact mepiquat chloride's influence on cotton, potentially causing varied outcomes among different locations. (Rosolem *et al*., 2013).

Plant defoliants are the chemicals which will promote the development of abscission layers in the leaf petioles, leading to the premature desiccation and shedding of foliage compared to its natural occurrence. Which will reduce the trash content in the lint and enhance the lint quality. Defoliants are chemicals that modify plant metabolism, inducing leaf shedding. In agriculture, they clear crop leaves to ease harvesting. Ethylene-based agents promote leaf drop, synchronous boll opening, and sunlight exposure, readying cotton for mechanical harvest. Timely and precise defoliation is vital for a successful harvest.(Sravanthi *et al*., 2022).

Various defoliants, including Dropp ultra, Etherel, Nacl, Paraquat, and Urea, are employed in cotton at varying rates depending on environmental conditions and cultivar used.

METHODS AND MATERIALS

Field experiment was conducted at RARS, Warangal during *kharif* -2022 season. The experimental site is geographically located in central agro climatic zone of Telangana. The soil of experimental site is clay loam in texture with nearly neutral p_H in reaction(7.2), E.C (0.53 dsm^{-1}), low in organic carbon (0.43%), medium in available N(209 kg ha^{-1}) & Phosphorous (28 kg ha^{-1}) and high in available potassium (334 kg ha^{-1}).

The experiment was laid out in a Randomized block design with eleven treatments. The treatment details are T_1: Mepiquat chloride (MC) 25g a.i ha^{-1} @ 40 &55 DAE + Etherel 2000ppm @ 40% boll burst, T_2: MC 25 g a.i ha^{-1} @ 40 & 55 DAE+ Etherel 2000ppm @ 60% boll burst, T_3: MC 20 g a.i ha^{-1} @ 40 DAE, MC 30 g a.i ha^{-1} @ 60DAE+ Etherel 2000ppm @ 40% boll burst T_4: MC 20 g a.i ha^{-1} @ 40DAE, MC 30 g a.i ha^{-1} @ 60DAE+ Etherel 2000ppm @ 60% boll burst T_5: MC 20 g a.i ha^{-1} @ 40,55 & 75 DAE+ Etherel 2000ppm @ 40% boll burst, T_6: MC 20 g a.i ha^{-1} @ 40,55 & 75 DAE + Etherel 2000ppm @ 40% boll burst, T_7: MC 25 g a.i ha^{-1} @ 40, 55 & 75 DAE+ Etherel 2000ppm @ 40% boll burst, T_8: MC 25 g a.i ha^{-1} @ 40, 55 & 75 DAE+ Etherel 2000ppm @ 60% boll burst, T_9: 20 g a.i ha^{-1}@ 40DAE, 25 g a.i ha^{-1} @ 55 DAE & 30 g a.i ha^{-1} @ 70DAE +Etherel 2000ppm @ 40% boll burst, T_{10}: 20 g a.i ha^{-1} @ 40 DAE, 25 g a.i ha^{-1} @ 55 DAE & 30 g a.i ha^{-1} @ 70DAE + Etherel 2000ppm @ 60% boll burst, T_{11}: Control.

The treatments are sown with a spacing of 80×20 cm on 25/06/2022. Recommended dose of fertilizers 120-60-60 NPK ha^{-1} ,urea, di ammonium phosphate, murate of potash are the fertilisers used in this experiment. Adequate plant protection measures were taken as per requirement. Randomly five plants were selected and tagged from each plot for recording various growth and yield parameters periodically and at harvest through destructive and non destructive sampling. The rainfall of 1223 mm was received during 57 rainy days during the entire period of crop growth. The mean maximum temperature and minimum temperature recorded was 30.6^{o}C and 21.7^{o}C respectively. All the data recorded in the study were conducted statistical analysis as suggested by Gomez and Gomez 1984.

RESULTS AND DISCUSSIONS

Initial and final plant population (No. ha^{-1})

Data relating to initial and final plant population (No. ha^{-1}) as influenced by application of different doses and various time of application of Mepiqaut chloride and different stages of Etherel application under HDPS was represented in the Table 1**.** Final plant population was found to be reduced in all the treatments over initial plant population due to heavy rainfall during early crop growth stages, plants lost during intercultural operations and dry matter collection.

Growth parameters

In cotton, plant height holds importance as it shapes node and internode structure, enabling the growth of essential sympodial branches that impact productivity. Table .2 displays plant height data across growth stages i.e., 30, 60, 90, 120 days after sowing (DAS), and at harvest. As application of growth regulators started at 40 Days after emergence, at 30 DAS plant height did not significantly differ among treatments. However as spraying of growth regulator treatments stopped at 75 Days after emergence, from 90 DAS of sowing to till the harvest change in plant height followed the same trend.

At Harvest among all treatments (T_{11}) control has shown highest plant height (121.73 cm), significantly lowest plant height was recorded with (T_{10}) M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 60% boll burst (95.3cm). Similar results were observed with Priyanka et al., (2022), Khetre *et al*.,(2018).Collins *et al* (2017).

Mepiquat chloride is a growth regulator used in cotton, which hinders the biosynthesis of gibberellic acid within the plant. Gibberellic acid is a key regulator of cell elongation and division, primarily responsible for stem elongation. Inhibition of gibberellic acid counters the elongation effect, resulting in shorter stems and overall reduced plant height. Suttle J.C (1995), Rademacher.W (2000).

With in similar Mepiquat chloride treatments application of 2000ppm Etherel at 40% boll burst resulted in lowest plant height compared to application of 2000ppm Etherel at 60% boll burst. This might be due to the reason that use of defoliants at early stages, potentially promoted the accelerated shedding of leaves, leading to a decrease in the absorption of photosynthates and ultimately causing a reduction in the height of the plants. Analogous outomes are observed by Sravanthi *et al*.,(2022), Kulvir and Pankaj (2015), Singh *et al*. (2017) and Mrunalini *et al*. (2019).

Dry matter production serves as the foundation for plant growth, development and yield. The use of plant growth regulators significantly impacted the accumulation of dry matter. Dry matter accumulation as influenced by various dosages and time of application of Mepiquat chloride and various stages of application of Etherel was presented in Table 3.. However dry matter accumulation followed same trend as plant height from 90 DAS to till harvest of the crop. At harvest control (T_{11}) treatment was significantly superior (5988.26 kg ha^{-1}) over all other treatments in dry matter accumulation and lowest dry matter accumulation was recorded with application of M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst (T_9) (4253.26 kg ha^{-1}). Similar findings were noted by Priyanka *et al* (2022), Kaul *et al* (2016), Paslawar *et al* (2015).

The decrease in the accumulation of dry matter could be because of both the observed decline in plant height and the disruption in the source sink relationship resulting from the application of Mepiquat chloride Priyanka *et al*.,(2021)

Same as plant height dry accumulation was high in spritzing of 2000ppm Etherel at 60% boll burst compared to etherel application at 40% boll burst. Statistically significant enhancement in dry matter was observed when defoliants were applied at a later stage compared to their early application. Delaying the defoliation process enabled increased carbon assimilation and the allocation of photosynthates towards the growth of cotton bolls and greater biomass accumulation. These findings align with the outcomes reported by Kulvir *et al*. (2015) and Mrunalini *et al*. (2019). Sravanthi *et al* (2022).

The decrease in the drymatter accumulation over control as effected by different Mepiquat chloride and Etherel treatments was depicted in the Fig 1. where reduction in plant dry matter ranged

from 11.82% with Spraying of MC 25 g a.i ha^{-1} @ 40 & 55 DAE+ Etherel 2000ppm @ 60% boll burst, T_3: MC 20g a.i ha^{-1} @40DAE (T_2) to 28.97% in Spraying of M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst (T_9).

YIELD

Data on seed cotton yield is presented in Table 3, where was highest seed cotton yield recorded with spritzing of MC 20 g a.i ha^{-1} @40,55 & 75 DAE+ Etherel 2000ppm @60% boll burst (T_6) (3163.57 Kg ha^{-1}) and lowest seed cotton yield was recorded in control treatment (T_{11}) (2262.17 Kg ha^{-1}). According to Patel *et al*., (2021).Brar *et al*., (2020) application of higher doses of M.C at higher no of doses resulted in higher seed cotton yield. In contrary to them here application 20 g of a.i ha^{-1} at 3 stages resulted in higher economic yield, this might be due to higher level of hindrance to gibberlin synthesis at higher doses of M.c , which inturn resulted in very low vegetative growth, which is necessary to support reproductive growth.

This may be because of better partioning of photosynthates to reproductive parts. generally in cotton excessive vegetative growth occurs at the cost of economic yield, application of Mepiquat chloride regulates the excessive vegetative growth, and resulted in more number of yield components and highest seed cotton yield. Uma maheshwaei *et al* (2019). Application of 20 g a.i ha^{-1} @ resulted in higher yields, this might be due higher level of hindrance to Gibberelin synthesis at high doses of M.C.

Among the various stages of Spraying of etherel , administering of 2000ppm of etherel at 60% boll burst resulted in higher seed cotton yield compared to etherel application at 40% boll burst stage. The reasons may be early defoliation may adversely affect all agronomic characteristics of crop, on contrary application of defoliators at correct time preferably not before 60% boll burst will allow the crop for better source- sink partitioning and good crop management, which ultimately results in higher yields (Snipes and Baskin, 1994) Similar results were observed with Sravanthi *et al* (2022),Raghavedra and Rama Reddy (2020), Singh *et al* (2017).

Data pertaining to stalk yield presented in Table 4, where highest stalk yield was observed in control (T_{11}) treatment (6673.33 Kg ha^{-1}) and lowest Stalk yield was recorded with (T_{10}) M.C application of 20,25 and 30 g a.i ha^{-1} @ 40,55 and 60 DAE + Etherel 2000ppm @ 60% boll burst because of reduction in plant height, accompanied by diminished accumulation of dry matter. Similar outcomes are noticed by Priyanka *et al* (2022), Patel *et al* (2021).

Same as seed cotton yield , stalk yield also varied with stage of application of etherel, among both stages i.e., 40% , 60% boll burst stages, application of etherel at 60 % boll burst resulted in higher stalk yield in all of M.C applied treatments.

Delayed defoliation will facilitate time foe more carbon accumulation and better partitioning of photo assimilates to all the plant parts. Similar results were observed with Sravanthi *et al* (2022), Mrunalini *et al* (2019).

Higher Harvest index was observed with with T_6 (MC 20 g a.i ha^{-1} @40,55 & 75 DAE application + Etherel 2000ppm spraying @40% boll burst) (36.89) and lowest recorded with control (25.28). Priyanka et al (2020) found similar outcome.

Table 1. Initial and Final of *Bt* cotton as influenced by application of different doses and application time Mepiqaut chloride and different stages of application of Etherel under HDPS.

TREATMENTS		Plant population (No. ha^{-1})	
No	**TREATMENT imposed**	**Initial Plant population**	**Final Plant population**
T_1	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 40% boll burst.	61771	59271
T_2	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 60% boll burst.	61354	59271
T_3	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55 DAE + Etherel 2000 ppm @ 40% boll burst.	61458	59375
T_4	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55DAE + Etherel 2000 ppm @ 60% boll burst.	61354	58854
T_5	M.C 20 g a.i ha^{-1} @ 40, 55 &70 DAE + Etherel 2000 ppm @ 40% boll burst.	61563	59201
T_6	M.C 20 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	61458	59375
T_7	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 40% boll burst.	61979	59757
T_8	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	61250	58750
T_9	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst.	61563	59479
T_{10}	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 60% boll burst.	61458	59375
T_{11}	Control (Water spray @ 40, 55 & 70 DAE)	61667	59167

Table 2. Plant height of *Bt* cotton as influenced by application of different doses and application time Mepiqaut chloride and different stages of application of Etherel under HDPS.

Treatments		Plant height (cm)				
No	**Treatment imposed**	**30 DAS**	**60 DAS**	**90 DAS**	**120 DAS**	**Harvest**
T_1	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 40% boll burst.	11.11	19.91	58.00	99.27	110.20
T_2	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 60% boll burst.	11.40	19.86	59.23	100.07	110.37
T_3	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55 DAE + Etherel 2000 ppm @ 40% boll burst.	10.83	19.18	56.40	97.73	109.97
T_4	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55DAE + Etherel 2000 ppm @ 60% boll burst.	11.79	19.17	57.73	98.23	109.30
T_5	M.C 20 g a.i ha^{-1} @ 40, 55 &70 DAE + Etherel 2000 ppm @ 40% boll burst.	11.59	21.90	52.60	87.20	99.07
T_6	M.C 20 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	11.76	21.26	53.07	88.00	98.83
T_7	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 40% boll burst.	11.23	19.70	50.77	86.20	97.20
T_8	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	10.62	19.71	51.90	87.53	96.90
T_9	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst.	11.60	20.77	48.50	84.00	95.87
T_{10}	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 60% boll burst.	11.14	20.64	49.77	85.07	96.23
T_{11}	Control (Water spray @ 40, 55 & 70 DAE)	10.93	27.31	66.43	112.70	121.73
SEm ±		**0.30**	**0.94**	**1.96**	**4.05**	**3.70**
C.D (p=0.05)		**NS**	**2.8**	**5.79**	**11.95**	**10.93**

Table 3. Drymatter of *Bt* cotton as influenced by application of different doses and application time Mepiqaut chloride and different stages of application of Etherel under HDPS.

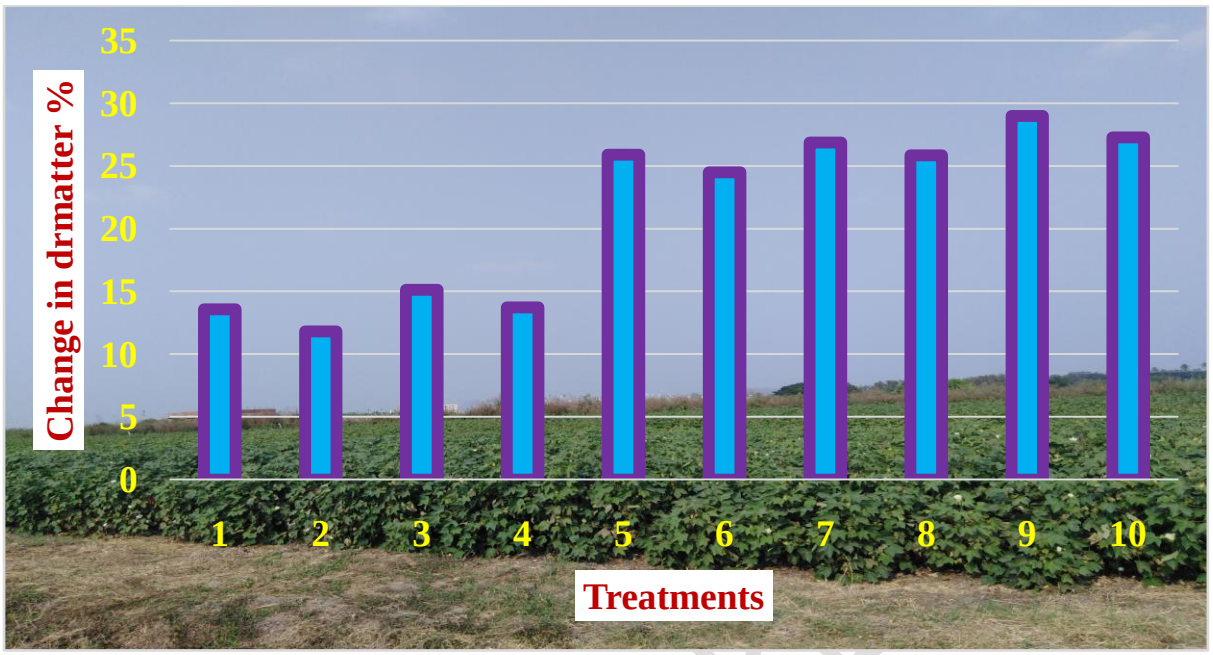
Treatments		Crop dry matter (Kg. ha $^{-1}$)				
No	**Treatment imposed**	**30 DAS**	**60 DAS**	**90 DAS**	**120 DAS**	**Harvest**
T_1	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 40% boll burst.	115.76	1696.47	3479.80	4219.60	5176.27
T_2	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 60% boll burst.	121.36	1686.60	3516.35	4300.23	5280.27
T_3	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55 DAE + Etherel 2000 ppm @ 40% boll burst.	119.41	1627.70	3294.00	4068.87	5082.20
T_4	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55DAE + Etherel 2000 ppm @ 60% boll burst.	121.79	1621.23	3360.33	4183.54	5166.87
T_5	M.C 20 g a.i ha^{-1} @ 40, 55 &70 DAE + Etherel 2000 ppm @ 40% boll burst.	119.67	1847.53	2804.15	3557.77	4437.77
T_6	M.C 20 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	109.41	1822.97	2851.28	3604.97	4521.63
T_7	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 40% boll burst.	115.23	1656.53	2688.00	3398.97	4378.97
T_8	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	116.17	1653.57	2735.10	3494.11	4440.77
T_9	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst.	119.05	1785.93	2598.50	3309.90	4253.26
T_{10}	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 60% boll burst.	123.49	1732.93	2637.88	3362.57	4355.78
T_{11}	Control (Water spray @ 40, 55 & 70 DAE)	124.78	2137.75	4231.50	5011.60	5988.26
SEm ±		**5.13**	**77.63**	**220.40**	**234.59**	**237.09**
C.D (p=0.05)		**NS**	**228.99**	**650.08**	**691.93**	**699.31**

Table 4. Yield of *Bt* cotton as influenced by application of different doses and application time Mepiqaut chloride and different stages of application of Etherel under HDPS.

Treatments		Seed Cotton Yield (kg ha^{-1})	Stalk yield (kg ha^{-1})	Harvest Index (%)
No	**Treatment imposed**			
T_1	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 40% boll burst.	2756.57	6028.13	31.24
T_2	M.C 25 g a.i ha^{-1} @ 40 & 55 DAE + Etherel 2000 ppm @ 60% boll burst.	2783.07	6027.60	31.46
T_3	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55 DAE	2613.47	5923.07	30.43

	+ Etherel 2000 ppm @ 40% boll burst.			
T_4	M.C 20 g a.i ha^{-1} @ 40 DAE and 30 g a.i ha^{-1} at 55DAE + Etherel 2000 ppm @ 60% boll burst.	2643.93	5982.20	30.43
T_5	M.C 20 g a.i ha^{-1} @ 40, 55 &70 DAE + Etherel 2000 ppm @ 40% boll burst.	3129.73	5420.80	36.58
T_6	M.C 20 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	3163.57	5408.27	36.89
T_7	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 40% boll burst.	3013.50	5362.27	35.91
T_8	M.C 25 g a.i ha^{-1} @ 40, 55 & 70 DAE + Etherel 2000 ppm @ 60% boll burst.	3041.20	5352.33	36.10
T_9	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 40% boll burst.	2921.67	5317.07	35.33
T_{10}	M.C 20, 25, 30 g a.i ha^{-1} @ 40, 55 & 70 DAE respectively + Etherel 2000 ppm @ 60% boll burst.	2942.67	5306.47	35.41
T_{11}	Control (Water spray @ 40, 55 & 70 DAE)	2262.17	6673.33	25.28
SEm ±		**113.15**	**203.12**	**1.07**
C.D (p=0.05)		**333.75**	**599.11**	**3.16**

Fig 1. Change in drymatter of *Bt* cotton as influenced by application of different doses and application time Mepiqaut chloride and different stages of application of Etherel under HDPS.



CONCLUSION

Application higher doses of Mepiquat chloride at 3 stages resulted in Lowest plant height, Drymatter accumulation, Stalk yield. spraying of Etherel 2000ppm at 60% boll burst resulted in superior agronomic characteristics compared to etherel application at all M.C application treatments. However, higher economic yields were observed with spraying of M.C @ 20 g a.i ha^{-1} at 40,55 and 70 DAE + Etherel 2000ppm @ 60% boll burst.

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