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Impact of Sowing time and Fertilizer doses on the Incidence of Mealy bug (*Maconellicoccus hirsutus* Green) in Mesta

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ABSTRACT
A study has been conducted to assess the effect of sowing dates and different fertilizer dosages on the incidence of mealybug, (Maconellicoccus hirsutus Green) and its effect on fibre yield of Mesta at Agricultural Research Station, Amadalavalasa, Srikakulam District, Andhra Pradesh for three consecutive seasons i.e. from kharif 2011-12 to 2013-14. The mealybug incidence was low in early sown crop of 1st May and 15th May with a mean incidence of 3.82 and 3.08 per cent, respectively and was on par with each other. Mealy bug incidence gradually increased with increase in fertilizer dosage irrespective of the date of sowing by recording lower incidence of 3.86% in 20-20-20 kgs NPK/ha followed by 40-20-20 (4.50), 60-30-30 (5.95) and 80-30-30 (7.64). The interaction effect of sowing dates and fertilizer dosages was found non-significant. Plant height, basal diameter and fiber yield were high in 15th May and 1st June sown crop with a fertilizer dose of 60-30-30kgs NPK/ha.
Key words: *Fertilizer doses, Mealybug (Maconellicoccus hirsutus), Mesta, Sowing time*

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INTRODUCTION

Mesta, commonly known as roselle (*Hibiscus sabdariffa* L.) and kenaf (*H. cannabinus* L), a herbaceous annual bast fibre crop grown successfully in tropical and sub-tropical climates (Copley, 1975) and believed to be originated from Afro-Asian countries, ranks next to jute in importance of fibre production. It is most adaptive than jute under diverse conditions of climate and soil and it is also tolerant to drought. In Andhra Pradesh, it is mainly concentrated in Vizianagaram and Srikakulam Districts, accounts for 98.7 per cent of the total area in the state (Sreelatha and Raju, 2004). However, there are certain abiotic and biotic constraints, significantly limiting the production. Pests and diseases are important biotic factors contributing towards low yield and economical management of these would certainly contribute to higher yields. Mesta is severely inflicted by many insect pests like mealybug, aphids, leafhoppers, whiteflies and semilooper. Among them, mealybug (*Maconellicoccus hirsutus* Green) is the major pest occurring throughout the crop growth period which is causing an accountable damage and has direct impact on the fibre yield loss of up to 40 per cent (Raju *et al*., 1988) Considering the severity of mealybug in Srikakulam and Vizinagaram districts, the present study was carried out to know the time of incidence and effect of fertilizer on the incidence of mealybug on mesta by which we can predict the occurrence of pest and intimate the suitable forewarning advises to the farming community with that the farmer can save the crop and also minimizes the cost of cultivation.

MATERIALS AND METHODS

The field experiment was conducted at Agricultural Research Station, Amadalavalasa, Srikakulam District, Andhra Pradesh for three consecutive seasons *i.e.* from *kharif* 2011-12 to 2013-14. The experiment was conducted in Split Plot Design and replicated thrice using the variety, AMV-5 with six main treatments (sowing dates *viz*., 1th May, 15th May, 1st June, 15th June, 1st July and 15th July) and four sub treatments (fertilizer dosages of NPK *i.e.* 20-20-20, 40-20-20, 60-30-30 and 80-30-30 kg NPK/ha). As per the

schedules, sowing was taken up with a spacing of 30cm x 10cm between rows and plants, respectively by hand dibbling. The mesta plants of different sowing dates were closely examined at regular interval commencing from germination till harvest. Data on the first appearance of major insect pests in the field were recorded. Data on mealybug infested plants was taken in square meter and expressed in per cent infestation at fortnightly interval from 15 days after sowing (DAS) to 120 DAS. The crop was harvested at 50 per cent flowering stage and harvested sticks were placed in micro pond for retting. After completion of retting process, fibre was extracted, washed and dried under sun light and fibre yield was recorded. The replication wise mean data of respective treatments was utilized for analysis through Split Plot design.

RESULTS & DISCUSSION

Effect of sowing dates and fertilizer dosages on mealy bug incidence

The results of the three consequent years revealed that there was a significant response of the pest incidence among the dates of sowings and fertilizer doses (Table 1). The mealybug incidence was low in early sown Mesta crop of 1st and 15th May with a mean incidence of 3.82 and 3.08 per cent, respectively and was on par with each other. The incidence was gradually build up with high incidence (7.67%) recorded in 1st June sown crop and then decreased in the subsequent sowings with 6.72, 6.29 and 5.33 per cent in 15th June, 1st July and 15 July sown crop, respectively. The results of the three year study showed that mealybug incidence was more in late sown crop compared to early sown crop. The present findings are in conformity with the finding of Ameta and Sumeria (2004) who reported that delay in sowings increased the infestation of midge, shoot fly and stem borer increases and adversely affected the plant growth and yield in sorghum crop.

Table 1: Effect of date of sowing and fertilizer dose on mealybug incidence
(Mean of three seasons of *kharif* 2012, 2013 and 2014)

Sub treatments Fertiliser dose (NPK kg/ha)	**Main Treatments (date of sowing)**						**Mean**
	***Cumulative incidence of Mealybug infestation (%)**						
	1st May	**15th May**	**1st June**	**15th June**	**1st July**	**15th July**	
F1: 20-20-20	3.40 (10.59)	2.15 (8.41)	5.63 (13.72)	4.41 (12.12)	3.84 (11.29)	3.72 (11.02)	**3.86 (11.21)**
F2: 40-20-20	3.34 (10.50)	2.70 (9.43)	6.17 (14.38)	5.68 (13.77)	5.07 (12.96)	4.07 (11.61)	**4.50 (12.11)**
F3: 60-30-30	3.55 (10.77)	3.33 (10.45)	8.47 (16.91)	8.00 (16.43)	6.87 (15.19)	5.45 (13.50)	**5.95 (13.89)**
F4: 80-30-30	5.01 (12.89)	4.16 (11.70)	10.41 (18.82)	8.80 (17.26)	9.38 (17.82)	8.08 (16.50)	**7.64 (15.83)**
Mean	**3.82 (11.19)**	**3.08 (10.00)**	**7.67 (15.96)**	**6.72 (14.90)**	**6.29 (14.32)**	**5.33 (13.18)**	
	F Test	**SEM**	**CD (P=0.05)**				
Main treatments (M)	Sig.	0.40	1.26				
Sub treatments (S)	Sig.	0.28	0.77				
Interaction (MxS)	NS						
(SxM)	NS						

*Mean Incidence recorded at 15 days interval up to 120 days of crop age
Values in the parenthesis are angular transformed values

Further, it was observed that mealybug incidence was dependent on fertilizer dose. Mealy bug incidence gradually increased with increase in fertilizer dosage irrespective of the date of sowing. The mean mealy bug incidence was low (3.86 %) in 20-20-20 kg NPK/ha followed by 40-20-20, 60-30-30, and 80-30-30 with 4.50, 5.95 and 7.64 per cent, respectively. High incidence of mealybug was noticed under high fertilizer dosages because of excessive nitrogenous fertilizer increased crop susceptibility to pests and this could be due to more succulence of plants caused by excessive fertilizer, which predisposed the plant foliage to be easily attacked by the sucking pests. The present results are in line with the findings of Patel *et al*. (2015) who reported that sucking pest population declined with decreased fertilizer level and vis-à-vis. Kalaichelvi (2008) who reported that higher population of aphid in crop fertilized with higher dose of nitrogen. The present results are in close conformity with the findings of Anusaha *et al*,, (2017) who reported that incidence of cotton aphids and leafhoppers was more in high doses of nitrogen both under protected and unprotected conditions. The interaction effect of sowing dates and fertilizer dosages was found non-significant.

Effect of sowing dates and fertilizer dosages on yield attributes

The data recorded on yield attributes viz. plant height and basal diameter in different sowing dates and fertilizer dosages (Table 2 and 3) revealed that the crop sown on 15th May recorded maximum plant height (383.82cm) and basal diameter (19.31mm) compared to other dates of sowings. From the three years mean data, it was observed significant higher plant height and basal diameter was observed in early sown crop of 1st May (355.55cm and 17.14mm, respectively), 15th May (383.82cm and 19.31mm, respectively) and 1st June (357.33cm and 18.16mm, respectively) to delayed sowing of 15th June (343.88cm and 17.26mm), 1st July (316.40cm and 15.52mm) and 15th July (275.58cm and 14.04mm). The present results are almost similar to the findings of Ameta and Sumeria (2004), who reported that late sown crop recorded lower plant height compared to higher plant heights in early sown crops in Sorghum crop. Plant height and basal diameter were gradually increased with an increase in fertilizer dose up to 60-30-30 kg NPK/ha, then decreased at highest dose of 80-30-30kgs NPK/ha by recording of 324.68cm and 17.04mm, respectively at 20-20-20kgs NPK/ha, 350.56cm and 16.82mm, respectively, at 40-20-20kgs NPK/ha, 348.71cm and 17.54mm, respectively at 60-30-30kgs NPK/ha and 331.09cm and 16.22mm, respectively at 80-30-30kgs NPK/ha irrespective of sowing dates. The interaction effect of sowing dates and fertilizer dosages was found non-significant.

Table 2: Effect of date of sowing and fertilizer dose on plant height
(Mean of three seasons of *kharif* 2012,2013 and 2014)

Sub treatments Fertiliser dose (NPK kg/ha)	Main Treatments (date of sowing)						Mean
	Plant height (cm)						
	1st May	15th May	1st June	15th June	1st July	15th July	
F1: 20-20-20	347.27	370.33	338.50	343.00	291.17	257.84	**324.68**
F2: 40-20-20	364.60	388.07	372.20	352.00	340.50	286.00	**350.56**
F3: 60-30-30	365.00	393.60	370.20	343.57	333.23	286.67	**348.71**
F4: 80-30-30	345.33	383.27	348.43	336.97	300.70	271.83	**331.09**
Mean	**355.55**	**383.82**	**357.33**	**343.88**	**316.40**	**275.58**	
	F Test	**SEM**	**CD (P=0.05)**				
Main treatments (M)	Sig.	0.95	3.50				
Sub treatments (S)	Sig.	0.90	2.50				
Interaction (MxS)	NS						
(SxM)	NS						

Table 3: Effect of date of sowing and fertilizer dose on basal diameter
(Mean of three seasons of *kharif* 2012, 2013 and 2014)

Sub treatments Fertiliser dose (NPK kg/ha)	Main Treatments (date of sowing)						Mean
	Basal diameter (mm)						
	1st May	15th May	1st June	15th June	1st July	15th July	
F1: 20-20-20	16.87	19.42	18.06	17.77	15.46	14.66	17.04
F2: 40-20-20	17.25	19.03	18.13	16.74	15.45	14.32	16.82
F3: 60-30-30	18.15	19.98	18.61	18.46	16.19	13.87	17.54
F4: 80-30-30	16.30	18.81	17.84	16.07	15.00	13.30	16.22
Mean	**17.14**	**19.31**	**18.16**	**17.26**	**15.52**	**14.04**	
	F Test	**SEM**	**CD (P=0.05)**				
Main treatments (M)	Sig.	0.128	0.405				
Sub treatments (S)	Sig.	0.113	0.314				
Interaction (MxS)	NS						
(SxM)	NS						

Effect of sowing dates and fertilizer dosages on fiber yield

The data on the effect of sowing dates and fertilizer dosages revealed that date of sowing and fertilizer dosages had significant effect on the fiber yield (Table 4). Significantly high fiber yield of 20.44 and 19.78 q/ha was recorded in 15th May and 1st June crop sown, respectively as against lower fiber yield of 17.76, 16.65, 11.46 and 7.43 q/ha observed in 1st May, 15th June, 1st July and 15th July sown crop, respectively. It was observed from the three years mean data that the fiber yield was more in early sown crop than delayed sown crop. In the present investigation, the results obtained are in close agreement with the earlier workers who recorded higher yield in timely sowing crop (Sontakke and Mishra, 1997). Delay in sowing of soyabean resulted in decrease in yields (Chandel and Gupta, 1995).

Table 4: Effect of date of sowing and fertilizer dose on fibre yield
(Mean of three seasons of *kharif* 2012, 2013 and 2014)

Sub treatments Fertiliser dose (NPK kg/ha)	Main Treatments (date of sowing) Fibre yield(q/ha)						Mean
	1st May	15th May	1st June	15th June	1st July	15th July	
F1: 20-20-20	17.22	19.67	20.02	15.62	11.38	7.12	**15.17**
F2: 40-20-20	17.96	20.02	20.16	17.06	11.45	7.62	**15.71**
F3: 60-30-30	18.43	21.87	20.84	18.00	12.54	7.93	**16.60**
F4: 80-30-30	17.42	20.21	18.11	15.91	10.49	7.05	**14.87**
Mean	**17.76**	**20.44**	**19.78**	**16.65**	**11.46**	**7.43**	
	F Test	**SEM**	**CD (P=0.05)**				
Main treatments (M)	Sig.	0.145	0.456				
Sub treatments (S)	Sig.	0.084	0.232				
Interaction (MxS)	Sig.						
(SxM)	Sig.						

Further, it was observed that the fibre yield was dependent on fertilizer dose. Fibre yield was gradually increased with an increase in fertilizer dose up to 60-30-30 kg NPK/ha, then decreased at highest dose of 80-30-30 kgs NPK/ha by recording fiber yield of 15.17, 15.71. 16.60 and 14.87 q/ha in 20-20-20, 40-20-20, 60-30-30 and 80-30-30 kgs NPK, respectively irrespective of sowing dates.

CONCLUSION

From this study, it can be concluded that mesta crop sown at 15th May with optimum fertilizer dose of 60-30-30 kg of NPK can minimizes the pest incidence and recorded higher fibre yield. This low cost recommendation will fetch high remunerative price to the farming community.

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