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Incidence of the yellow jute mite *Polyphagotarsonemus latus* (Acari: Tarsonemidae) depending on the growing season, day hours, sowing time, plant canopy and plant age in Bangladesh

Md. Nazrul Islam[1], Khandakar Shariful Islam[2], Mahbuba Jahan[2] & Md. Sohanur Rahman[1]*

[1]*Department of Entomology, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207, Bangladesh. E-mail: nazrulbjri@yahoo.com, sohanbau2010@gmail.com*
[2]*Department of Entomology, Bangladesh Agricultural University, Mymensingh, Bangladesh. E-mail: shariful@bau.edu.bd, jahan-bau@bau.edu.bd*
**Corresponding author: sohanbau2010@gmail.com*

ABSTRACT

The yellow jute mite *Polyphagotarsonemus latus* is one of the major pests of jute in Bangladesh. The objectives of this research focussed on establishing the incidence of the yellow jute mite depending on the sowing date, plant age, growing season, hours of the day, environmental variables (temperature, relative humidity (RH) and rainfall), and plant morphology. Three major peaks of the mite population density were recorded: 80.75 mites/cm^2 on 9 June, 74.25 mite/cm^2 on 2 June, and 63.75 mites/cm^2 on 26 May 2011. The prevailing dry conditions (ca. 80 % RH) with moderately high temperatures and without rainfall were found to be favourable for the population build-up; rainfall had a strong negative direct effect on the yellow mite population density. The highest mite population density was observed at noon (64.42 mites/cm^2), with significantly lower counts during morning (48.11 mites/cm^2) and afternoon (43.33 mites/cm^2) hours. The infestation rate was the highest on earlier sown plants (59.33 mites/cm^2; 15 March), with the counts decreasing for plants sown later (52.55 mites/cm^2, 30 March; 42.30 mites/cm^2, 15 April). The highest mite population (57.25 mites/cm^2) was found on jute plants at 90 days after sowing (DAS), which was significantly different from those on plants of other ages: 11.38, 51.10 and 18.45 mites/cm^2 at 45, 60 and 120 DAS, with the lowest count (4.78 mites/cm^2) at 30 DAS. As regards the distribution of the yellow mite on the jute plant, the highest population density (60.54 mites/cm^2) was recorded on the five apicalmost leaves, with significantly lower counts on the 2nd and 3rd 5-leaf sets (15.96 and 2.9 mites/cm^2, respectively). In terms of the prevalence of the yellow mite on the leaf surfaces, a significantly greater mean population (63.40 mites/cm^2) was recorded on the lower surface as opposed to the upper surface (5.62 mites/cm^2).

KEYWORDS: Acari, *Polyphagotarsonemus latus*, broad mite, bionomics, infestation, phenology, population dynamics, plant age, sowing time, plant pests, *Corchorus*, jute.

বিমূর্ততা

হলুদ পাট মাইট পলিফাগোটারসোনমাস ল্যাটাস বাংলাদেশের পাটের অন্যতম প্রধান পোকা| এই গবেষণার উদ্দেশ্যগুলি বীজ বপনের তারিখ, উদ্ভিদের বয়স, ক্রমবর্ধমান ঋতু, দিনের ঘন্টা, পরিবেশগত পরিবর্তনশীল (তাপমাত্রা, আপেক্ষিক আর্দ্রতা (আরএইচ) এবং বৃষ্টিপাত) এবং উদ্ভিদ রূপবিজ্ঞানের উপর নির্ভর করে হলুদ পাটের পোকার প্রাদুর্ভাবের উপর নির্ভর করে| মাইট জনসংখ্যার ঘনত্বের তিনটি প্রধান পীক রেকর্ড করা হয়েছিল:

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৯ জুনে ৮০.৭৫ মাইট / সেমি^{2}, ২ জুনে ৭৪.২৫ মাইট / সেমি^{2} এবং ২৬ মে ২০১১-তে ৬৩.৭৫ মাইট / সেমি^{2}| বিস্তৃত শুকনো পরিস্থিতি (সিএ, ৮০% আরএইচ) মাঝারিভাবে উচ্চ তাপমাত্রা এবং বৃষ্টিপাত ছাড়াই জনসংখ্যা গঠনের পক্ষে অনুকূল বলে মনে হয়েছিল; বৃষ্টিপাতের হলুদ মাইট জনসংখ্যার ঘনত্বের উপর নেতিবাচক সরাসরি প্রভাব ফেলেছিল| সর্বাধিক মাইট জনসংখ্যার ঘনত্ব দুপুরে (৬৪.৪২ মাইট / সেমি^{2}) লক্ষ্য করা গেছে, সকালে (৪৮.১১ মাইট / সেমি^{2}) এবং বিকেলে (৪৩.৩৩ মাইট / সেমি^{2}) ঘন্টা উল্লেখযোগ্যভাবে নিম্ন গণনা সহ, পূর্বের বপন করা উদ্ভিদের (৫৯.৩৩ মাইট / সেমি^{2}; ১৫ মার্চ) সবচেয়ে বেশি পরিমাণে আক্রান্তের হার ছিল, পরে জন্মানো উদ্ভিদের জন্য গণনা কমতে থাকে (৫২.৫৫ মাইট / সেমি^{2}, ৩০ মার্চ; ৪২.৩০ মাইট / সেমি^{2}, ১৫ এপ্রিল)| সর্বোচ্চ মাইট জনসংখ্যা (৫৭.২৫ মাইট / সেমি^{2}) পাটের গাছগুলিতে বপনের ৯০ দিন পরে (ডিএএস) পাওয়া গিয়েছিল, যা অন্যান্য বয়সের গাছের চেয়ে উল্লেখযোগ্যভাবে পৃথক ছিল: ১১.৩৮, ৫১.১০ এবং ১৮.৪৫ মাইট / সেমি^{2} ৪৫, ৬০ এবং ১২০ ডিএএস, ৩০ ডিএএস এ সর্বনিম্ন গণনা (৪.৭৮ মাইট / সেমি^{2}) সহ পাট উদ্ভিদে হলুদ রঙের পোকার বিলি বিতরণের বিষয়ে, সর্বোচ্চ জনসংখ্যার ঘনত্ব (৬০.৫৪ মাইট / সেমি^{2}) দ্বিতীয় এবং তৃতীয় ৫-পাতার সেটগুলিতে (১৫.৯৬ এবং ২.৯ মাইট / সেমি^{2}, যথাক্রমে)| পাতার পৃষ্ঠতলগুলিতে হলুদ রঙের মাইটের বিস্তারের পরিপ্রেক্ষিতে উপরের পৃষ্ঠের বিপরীতে (৫.৬২ মাইট / সেমি^{2}) বিপরীতে উল্লেখযোগ্যভাবে বৃহত্তর গড় জনসংখ্যা (৬৩.৪০ মাইট / সেমি^{2}) নিম্ন পৃষ্ঠে রেকর্ড করা হয়েছিল|

কীওয়ার্ডস: একারি, পলিফাগোটারসোনমাস ল্যাটাস, ব্রড মাইট, ইনফেসেশন, ফেনোলজি, জনসংখ্যা গতিবিদ্যা, গাছের বয়স, বপনের সময়, গাছের কীট, করচরাস, পাট|

INTRODUCTION

The plant genus *Corchorus* L. (Malvaceae) comprises several dozens of species, two of which—white jute (*Corchorus capsularis* L.) and tossa jute (*C. olitorius* L.)—are commercially grown primarily in the Indo-Bangladesh region, as well as in other Asian and African countries. About 90 % of world's jute is produced in Bangladesh and India (FAO 2020). In Bangladesh, about 758,248 ha were under jute in 2018, which yielded 1613.8 thousand tons (FAO 2020). Jute is attacked by various insect and mite pests. About 40 species of insects and mites are considered to be pests of jute in Bangladesh, with *Polyphagotarsonemus latus* (Banks, 1904) (broad mite, yellow mite, or yellow tea mite) being one of the commonest and most destructive agents (Dean 1979). The yellow mite is extremely polyphagous and attacks plants of about 60 families worldwide (Gerson 1992). The yellow mite infestation in jute normally begins on young apical leaves and causes damage by sucking off the plant sap, which results in wrinkled and curly appearance of tender leaves. Gradually, the colour of leaves changes to coppery or purplish, they finally dry up and fall down (Siddique & Kabir 1978; Khan 2018). The vertical growth of the internodes is suppressed, whereas branching is enhanced (Kabir 1975). The infested plant remains stunted, and the fibre yield can be reduced by up to almost 75 % under both field and net house conditions (e.g. Kamruzzaman *et al*. 2013*a*, *b*). The yellow mite also attacks flower buds and young seed pods. The infested flower buds cannot bloom properly, the floral parts become crinkled and the colour changes from yellow to blackish. The seed pods fail to develop, which results in reduced

seed production (Siddique & Kabri 1978). The damage caused by the yellow mite is often termed as "Telenga" or "Telchita" disease in Bangladesh (Kabir 1975).

Early sown jute crop is more susceptible to damage compared to lately sown crop (Gotyal *et al*. 2018). Infestation by the yellow mite occurs in mid-May and the population reaches its highest in June and in late July. The dry period is suitable for rapid proliferation of the mites, while damp weather and heavy rainfall are unfavourable for the infestation (Kabir 1975). It is very difficult to measure the population of *P. latus* in the field due to rapid change in the environment's factors (Chatterji *et al*. 1978), and recent information regarding the seasonal incidence of the yellow mite under field conditions in Bangladesh is unavailable.

The present study provides a framework for effective control of the yellow jute mite under natural conditions.

MATERIALS AND METHODS

Incidence of yellow mite during jute growing season April to September, 2011

Jute plants were grown in the field at Bangladesh Jute Research Institute (BJRI) for studying the incidence of the yellow mite during different stages and months of the growing period. The plants were not treated with any acaricide or other chemical and allowed to be infested naturally. Samples of infested leaves were randomly and on a weekly basis collected from the mite infested plants by taking four leaves from the top. The leaves were carried to the laboratory and cut into pieces of 1 cm^2 to standardize observation. The prepared samples were then examined under stereo microscope for recording different stages of yellow mite. The number of eggs, larvae and adults per 1 cm^2 were recorded. Observations commenced from the early growing stage in April 2011 and continued up to the stage ready for harvesting in September 2011. Average temperature, humidity and rainfall data were also recorded weekly.

Mite population at different periods of day

Activity of the yellow mite may vary during different hours of the day. Infested leaf samples were collected randomly from different mite infested plants at three different periods of day, viz. morning, noon and evening. Mite populations per 1 cm^2 were observed and counted under a microscope as in the previous experiment.

Effect of early and late sowing on the incidences of yellow mite

To investigate the effect of the sowing date on the incidence of the yellow mite, the jute variety O-9897 was sown in the earthen pots on the BJRI greenhouse premises on three different dates, viz. 15 March, 30 March and 15 April 2011. The plants were observed continuously for the infestation of the mite. When sufficient natural infestation was built up (at 60 days after sowing), the leaf samples were collected separately from plants sown on different dates and mite population per 1 cm^2 was counted under a microscope in the laboratory. The populations of the yellow mite on plants sown on different dates were analysed and tabulated to compare the effect of sowing time on the incidence of the pest.

Preference of the yellow mite for leaves of different age

The yellow jute mite is known to attack the upper part of the jute plant, especially young and unfolded leaves. In this observation, top 15 leaves were collected from the mite infested plant in the field and checked for the preference of the yellow mite. The leaves were divided into three groups consisting of five leaves each: the topmost five leaves, 2nd five leaves and 3rd five leaves. The presence of the mites was also recorded from the lower and upper surfaces of the leaves. The population of mites per 1 cm^2 was observed under microscope. After counting the number of the yellow mites, they were analysed for their significant preference for the leaves of a particular age or a specific leaf surface.

Relationship between the plant age and mite infestation

Infestation by the yellow mite may be found throughout the entire growing period of the jute plant, but the level of infestation vary depending on the growth stage and age of the jute plants. To investigate the level of infestation at different ages of the plants, top 15 infested leaves were collected at 30, 45, 60, 90 and 120 days after sowing and mite population per 1 cm^2 was recorded under a microscope. The relationship between the age of the jute plants and the infestation of the yellow mite was determined.

Analysis of data

Raw data were subjected to the one-way analysis of variance (ANOVA) and Tukey's honestly significant difference (HSD) post-hoc test in SPSS Statistics.

RESULTS AND DISCUSSION

Incidence of the yellow mite during the 2011 jute growing season

The yellow mite was found in the jute field throughout the growing period of the crop. Fluctuations of the mite population were common during the season. A steady increase of the population was recorded during the last half of May to the early half of June, with three major peaks during the season. The population of the yellow mite reached its highest density (80.75 mites/cm^2) on 9 June at temperature 31.6 °C with 77.5 % RH and 0 mm rainfall (Table 1). The second peak (74.25 mites/cm^2) occurred on 2 June at 31.0 °C with 79.0 % RH and 0 mm rainfall. The third peak (63.75 mites/cm^2) was recorded on 26 May at 29.9 °C temperature with 80.0 % RH and 0 mm of rainfall. Another two peaks were observed on 28 July and 2 September with comparatively low mite counts of 59.50 and 49.50 mites/cm^2, respectively. The lowest population density (23 mites/cm^2) was recorded on 21 July after a rainfall of 54 mm. The data clearly indicate that rainfall had a direct effect on the population density of the yellow mite (Table 1).

All the meteorological data—temperature, relative humidity and rainfall—influence the population of the yellow mite to a considerable extent. The prevailing dry conditions (around 80 % RH) with moderately high temperatures and without rainfall seem to be favourable for the population build-up.

Table 1. The population dynamics of the yellow mite on the jute crop sown on 15 March in the field.

Date of observation	Mites per 1 cm² of leaf (mean±SE)	Temperature (°C) (mean±SE)	Humidity (%) (mean±SE)	Rainfall (mm)
28/04/2011	31.75 ± 1.89	28.0 ± 3.0	65.0 ± 2.5	4
05/05/2011	45.75 ± 2.50	29.8 ± 3.3	70.0 ± 3.0	0
12/05/2011	35.75 ± 2.17	30.8 ± 2.8	75.0 ± 5.0	24
19/05/2011	43.50 ± 1.32	27.5 ± 2.0	77.0 ± 3.0	10
26/05/2011	63.75 ± 1.89	29.9 ± 3.4	80.0 ± 5.0	0
02/06/2011	74.25 ± 1.43	31.0 ± 2.5	79.0 ± 4.0	0
09/06/2011	80.75 ± 1.49	31.3 ± 2.3	77.5 ± 4.5	0
16/06/2011	33.75 ± 0.85	31.8 ± 2.8	82.5 ± 4.5	43
23/06/2011	41.50 ± 2.53	30.3 ± 3.3	81.0 ± 4.0	10
30/06/2011	31.50 ± 1.55	29.3 ± 2.3	75.0 ± 5.0	45
07/07/2011	44.00 ± 1.68	30.3 ± 1.3	80.0 ± 5.0	5
14/07/2011	43.75 ± 4.50	29.2 ± 1.2	82.5 ± 3.5	8
21/07/2011	23.00 ± 1.97	29.5 ± 1.5	81.0 ± 4.0	54
28/07/2011	59.50 ± 2.10	31.0 ± 1.5	81.0 ± 4.0	0
04/08/2011	32.00 ± 1.47	29.5 ± 1.5	79.0 ± 4.0	10
11/08/2011	31.25 ± 2.98	28.9 ± 1.6	77.5 ± 4.5	7
18/08/2011	28.50 ± 1.93	29.7 ± 2.9	76.8 ± 3.3	30
25/08/2011	33.50 ± 1.55	30.0 ± 2.0	80.0 ± 5.0	4
02/09/2011	49.50 ± 2.10	29.0 ± 1.5	79.3 ± 5.0	0
09/09/2011	36.25 ± 1.97	29.0 ± 2.5	76.8 ± 3.3	3
16/09/2011	30.25 ± 2.25	28.5 ± 1.0	78.0 ± 2.0	24
23/09/2011	35.50 ± 1.04	29.4 ± 2.9	79.0 ± 4.0	0
30/09/2011	23.00 ± 1.29	29.3 ± 1.3	78.0 ± 3.0	0

Moutia (1958) reported that heavy rainfall reduced the mite infestation rate considerably. According to Kabir (1975), the initial infestation of yellow mite occurs in mid-May and the population reaches peak period at the end of June and again in late July. Nahar (1998) found that dry weather and high temperature with low rainfall increased the population, whereas high rainfall lowered the population density. Rahman and Khan (2012) observed the maximum counts of the yellow mite during the second half of June in two consecutive years, with a positive association of the mite incidence with relative humidity and negative with rainfall. Bathani *et al.* (2019) demonstrated a positive yet non-significant relationship with the maximum temperature; the minimum temperature, relative humidity, wind velocity and rainfall negatively affected the density of the mite population but the relationship was non-significant. Curiously, no impact of rainfall or even a positive correlation with rainfall were recorded for *P. latus* on chilli in West Bengal and Gujarat, India (Anonymous 1998: 47, 53).

Overall, the present findings and the reports of other authors clearly indicate that rainfall has a strong direct effect on the yellow mite population density, with heavy rainfall reducing the mite population to a great extent; whereas the influence of other weather parameters is less certain. There may be a considerable variation of the rainfall pattern from year to year, which may cause a change in the population level of the mite in different growing periods of the jute crop.

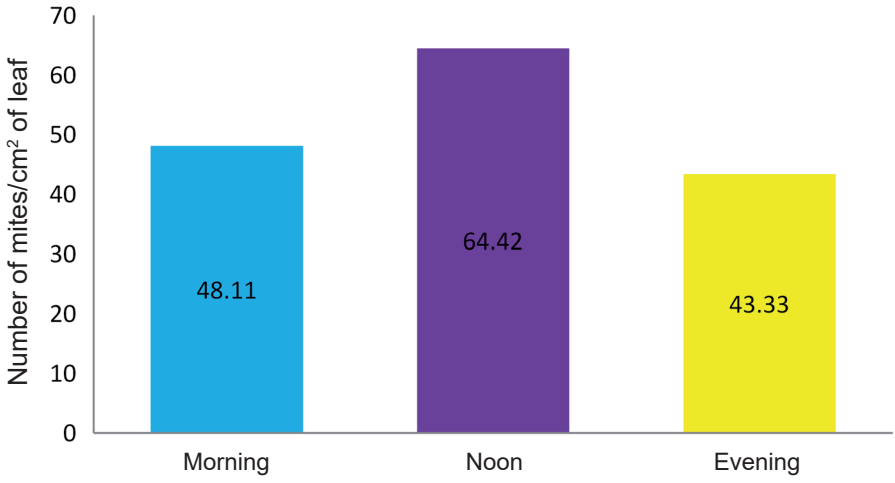

Fig. 1: Diurnal fluctuations of the yellow jute mite population.

Diurnal mite population dynamics

The mite population density varied significantly depending on the time of the day ($n=80$, $F_{2,237}=306.41$, $p<0.001$) (Fig. 1). The highest counts of 64.42 mites/cm^2 were observed at noon (1 PM). The population densities of 48.11 and 43.33 mites/cm^2 were recorded at 8 AM and 5 PM, respectively. This observation corroborates data by Bathani *et al.* (2019), who showed a positive and significant correlation of the yellow mite population density on sesame with bright sunshine hours. Thus, the higher temperatures and insolation encourage the yellow mite to attack young apical leaves.

Mite population dynamics depending on the date of sowing

Mite populations varied significantly depending on the sowing period (Fig. 2). The highest population density of 59.33 mites/cm^2 was found on the jute plants sown on 15 March at 60 days after sowing (DAS), which was significantly different compared to plants sown on 30 March (52.55 mites/cm^2) and on 15 April (42.30 mites/cm^2). Thus, the plants sown early in the season were found to be infested more by the yellow mite than those sown later.

Other authors also reported a decreased yellow mite infestation rate with delayed sowings. Thus, Hath and Jaydeb-Ghosh (2001) observed 49.75, 38.06 and 21.25 mites per 5 leaves on crops sown on 2nd and 4th weeks of April and 2nd week on May, respectively. Hath (2004) showed that early sowing resulted in a high yellow jute mite infestation for all cultivars, which gradually decreased with a delay in sowing date (3rd week of April, 1st and 3rd weeks of May). Gotyal *et al*. (2018) reported significantly higher rates of infestation in early (15 March) compared to late (15 April) sown jute crops at both 45 (51.66 vs 21.06 mites/cm^2) and 60 (71.78 vs 21.57 mites/cm^2) days after sowing.

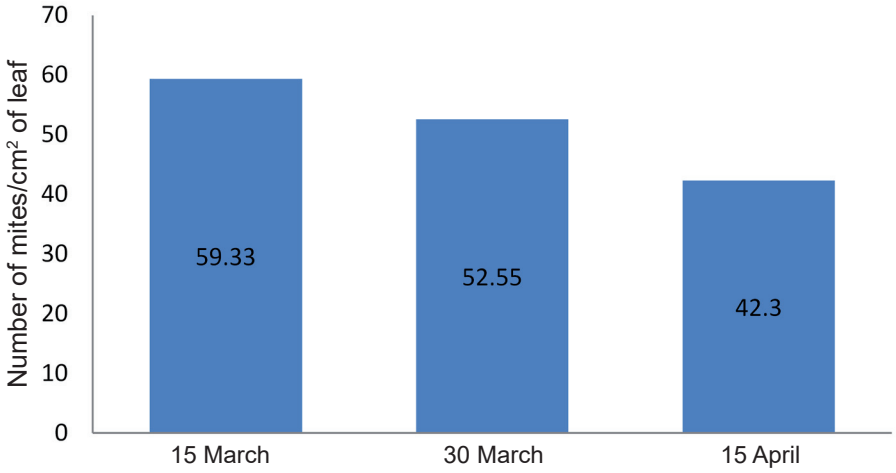

Fig. 2: The yellow mite population density at 60 DAS, depending on the sowing date of the jute plants in 2011.

Distribution of mite populations on different parts of the plant

The yellow mite population density varied greatly depending on the position on the jute plant. The highest mite counts (60.54 mites/cm^2) was found on the topmost five apical leaves (Fig. 3). On the 2nd and 3rd top five apical leaves, the mite population densities were significantly lower, viz. 15.96 and 2.90 mites/cm^2, respectively. The yellow mite also showed significant preference for the lower surface of the leaves, with 63.40 mites/cm^2 compared to 5.62 mites/cm^2 on the upper surface. Thus, *P. latus* mostly preferred the apicalmost young leaves for feeding, sheltering and oviposition. The number of laid eggs varied between 2–100 per the topmost or

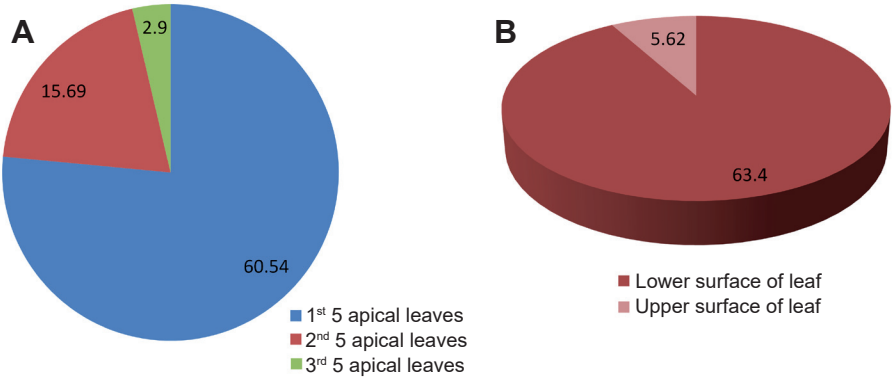

Fig. 3: Distribution of the jute yellow mite in different groups of apical leaves (A) and on the leaf surfaces (B).

second leaf. The third and fourth leaves were almost devoid of mites. The nymphal stages were found to be distributed mainly on the topmost and second leaves, and were negligible on the third and fourth leaves.

Gerson (1992) reported similar distribution of the mite on the lower surface of apical leaves and flowers of various plants for feeding and oviposition, and Khan (2018) found that young apical leaves of jute plant are most affected. Hath (2000) studied the distribution pattern of the yellow mite population on different leaves of early sown crops of three varieties of each *C. capsularis* (JRC 321, JRC 212 and JRC 7447) and *C. olitorius* (JRO 632, JRO 524 and JRO 7835). Significant variation in the mite populations on different leaves was observed, yet the second leaf from the top was found to harbour the highest number of the yellow mite in both species of jute.

Mite population at different days after sowing

A significant difference was found in the mite infestation depending on the age of the jute plants (Fig. 4). The highest mite population (57.25 mites/cm^2) was recorded at 90 days after sowing (DAS). The populations of 11.38, 51.10 and 18.45 mites/cm^2 were recorded at 45, 60 and 120 DAS, respectively. The lowest mite population (4.78 mites/cm^2) was observed at 30 DAS.

Gotyal *et al.* (2018) reports 51.66 and 71.78 mites/cm^2 at 45 and 60 DAS for jute sown on 15 March over a 3-year period of observation in West Bengal, India. Interestingly, their data on jute sown on 15 April do not significantly differ at 45 and 60 DAS (21.06 vs 21.57 mites/cm^2).

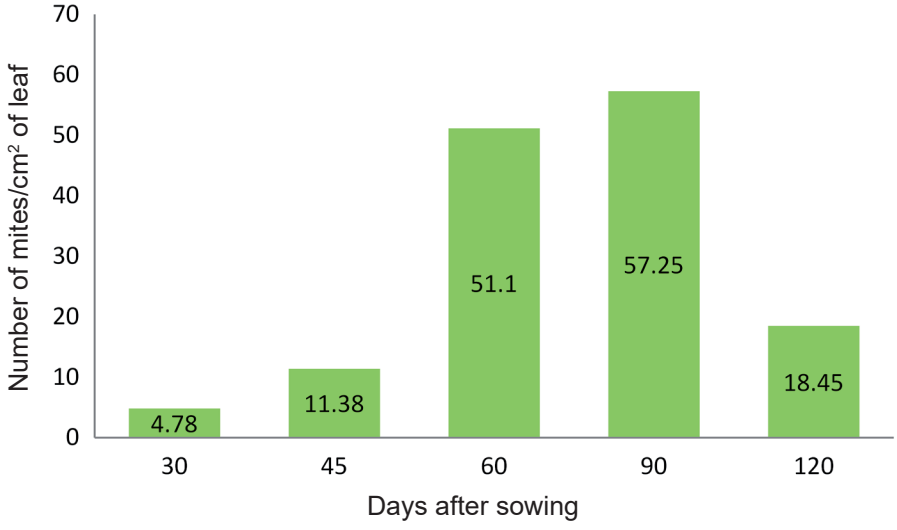

Fig. 4: Plant age and the level of the mite infestation (pooled data). (ANOVA, $F_{4,195}$=796.20, p<0.001; Tukey's HSD post-poc test, P<0.05).

The differences in the mite populations at different days after sowing suggest that the pest infestation attains its peak when the plants reach a specific level of growth after a certain age. However, the density of the mite population is also affected by abiotic factors as it has been discussed in the earlier sections.

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REFERENCES

Anonymous, 1998. *All India coordinated research project on agricultural acarology. Progress report 1996–1998*. University of Agricultural Sciences, Gandhi Krishi Vigyana Kendra, Bangalore, iv+280 pp.
http://krishikosh.egranth.ac.in/handle/1/2048796

Bathani, S.B., Patel, M.L. & Hadiya, N.J. 2019. Population dynamics of sesame broad mite, *Polyphagotarsonemus latus* (Banks) in relation to weather parameters. *International Journal of Current Microbiology and Applied Sciences* **8** (7): 509–514.
https://doi.org/10.20546/ijcmas.2019.807.062

Chatterjee, D.K.P.V., Rao, P.V., Singh, B., Tripathi, R.I., Das, LK. & Battachryarya, S.P. 1978. Effect of environmental factors on the incidence of major pests of jute, *Corchorus olitorius*. *Journal of Entomological Research* **2** (2): 163–166.
https://www.cabi.org/ISC/abstract/19790569080

Dean, G.J. 1979. The major insect pests of rice, sugarcane and jute in Bangladesh. *International Journal of Pest Management* **25** (4): 378–385.
https://doi.org/10.1080/09670877909414358

FAO [Food and Agriculture Organization]. 2020. *FAOSTAT*. The Food and Agriculture Organization of the United Nations, Rome.
http://www.fao.org/faostat/en/#data/QC (retrieved 7/09/2020)

Gerson, U. 1992. Biology and control of the broad mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae). *Experimental & Applied Acarology* **13**: 163–178.
https://doi.org/10.1007/BF01194934

Gotyal, B.S. Selvaraj, K., Satpathy, S. & Mitra, S. 2018. Effect of sowing dates and insecticides on yellow mite, *Polyphagotarsonemus latus* infestation in jute. *Journal of Entomological Research* **42** (1): 13–18.
http://dx.doi.org/10.5958/0974-4576.2018.00003.8

Hath, T.K. 2000. Distribution of yellow mite (*Polyphagotarsonemus latus* Banks) population on leaves of different jute varieties. *Environment and Ecology* **18** (3): 578–580.

———2004. Effect of sowing and jute varieties on the incidence of yellow mite (*Polyphagotarsonemus latus* Banks) and jute semilooper (*Anomis sabulifera* Guen.) under terai region of West Bengal. *Journal of Entomological Research* **28** (4): 311–315.

Hath, T.K. & Ghosh, J. 2001. Influence of date of sowing on the incidence of yellow mite, *Polyphagotarsonemus latus* Banks on different varieties of jute under terai agroecology of West Bengal. *Journal of Entomological Research* **25** (2): 87–92.

Kabir, A.K.M.F. 1975. White mite, *Hemitarsonemus latus* (Banks) Ewing. *In*: Kabir, A.K.M.F., *Jute pests of Bangladesh*. Bangladesh Jute Research Institute, Dhaka. pp. 28–33.

Kamruzzaman, A.S.M., Alam, M.Z. & Miah, M.R.U. 2013*a*. Effect of yellow mite, *Polyphagotarsonemus latus* (banks) density on hosts (*Corchorus olitorius* L.) phenology and assessment of yield loss under net house condition. *African Journal of Agricultural Research* **8** (4): 380–385.
https://doi.org/10.5897/AJAR12.1622

Kamruzzaman, A.S.M., Alam, M.Z., Miah, M.R.U. & Siddiquee, Sh. 2013*b*. Impact of yellow mite (*Polyphagotarsonemus latus* [Banks]) density on host's (*Corchorus capsularis* L.) phenology and assessment of yield loss under field conditions. *Entomological Research* **43** (4): 243–252.
https://doi.org/10.1111/1748-5967.12025

Khan, M.M.H. 2018. Evaluation of different mutants against insect and mite pests with natural enemies in coastal jute ecosystem. *Journal of the Asiatic Society of Bangladesh, Science* **44** (1): 23–33.
https://doi.org/10.3329/jasbs.v44i1.46543

Moutia, L.A. 1958. Contribution of the study of some phytophagous Acarina and their predators in Mauritius. *Bulletin of Entomological Research* **49** (1): 59–75.
https://doi.org/10.1017/s0007485300053438

Nahar, L. 1998. *Effects of temperature, humidity and rainfall on the ecology and reproduction of yellow mite,* Polyphagotarsonemus latus *(Banks)*. MSc Thesis. Dhaka University, 75 pp.

Rahman, S. & Khan, M.R. 2012. Incidence of pests in jute (*Corchorus olitorius* L.) ecosystem and pest–weather relationships in West Bengal, India. *Archives of Phytopathology and Plant Protection* **45** (5): 591–607.
https://doi.org/10.1080/03235408.2011.588053

Siddique, M.A.B. & Kabir, A.K.M.F. 1978. Bioecological studies of jute yellow mite. *Bangladesh Journal of Agricultural Research* **3**: 303–307.