Original Research Article

Seasonal incidence of tea mosquito bug, *Helopeltis s*pp. in guava, cv. L-49 at ARS- Hagari, Ballari, Karnataka

ABSTRACT

Insect pests are the major constraints in guava production as well as its productivity. Among many pest Tea mosquito bug (TMB) or guava kajji bug, *Helopeltis* spp. (Heteroptera: Miradae) is the major pest causes significant damage to the plants. Adults and nymphs suck the sap from young leaves, tender shoots, flower buds and small fruits. If the fruits are young, they dry up and drop down. Damage to the leaves and shoots cause drying and withering of shoots. Black specks are noticed on the flower buds, which later coalesce and dry up. On fruits, with the maturation, the feeding punctures expand and results in corky formation affecting the marketable yield. This leads in loss of fruits to an extent of 60-70 per cent. The information with regard to pest status of tea mosquito bug and seasonal incidence in guava is lacking. In light of the above, the present investigations were undertaken. The incidence pattern of tea mosquito bug on guava was studied at Agricultural Research Station (ARS), Hagari, Ballari, Karnataka. Observations were made on total number of both affected and healthy parts *viz*., young leaves, flower buds and fruits on the plants at fortnightly intervals commencing from June 2019 to May 2021. The data of two years revealed that the pest incidence on young leaves was initiated (4.11 %) during first fortnight of July and peaked (18.59 %) during October first fortnight. Infestation on flower buds was noticed during August first fortnight (8.29 %) and peaked (23.30 %) during second fortnight of October. Fruit infestation was observed (8.89 %) in first fortnight of August, increased gradually over months and peaked (23.30 %) during October second fortnight. Correlation studies on impact of weather parameters on fruit infestation revealed significant negative correlation with respect to temperature. However, relative humidity and rainfall were significantly positive correlated towards fruit infestation.

Key Words: Seasonal incidence, tea mosquito bug, guava, ARS, Hagari

INTRODUCTION

Guava (*Psidium guajava* L.), commonly called as “apple of the tropics” is an important fruit crop of India. It is one of the most delicious and popular fruit in tropical as well as subtropical regions of the world and is extensively grown in similar climatic regions of India. Guava has gained

a considerable place among the growers as well as consumers because of its high nutritive value with pleasant aroma, good flavour, availability throughout the year at moderate price.

Among the various constraints that affects the guava production and productivity, insect pests are the major one. One of the reason for serious pest problems on guava is attributed to its wide area of mono-culturing and intensive cultivation practices. As many as 80 insect pests have been reported on guava (Haseeb and Sharma 2002). Of these, the mosquito bug, popularly known as tea mosquito bug (TMB) or guava kajji bug, *Helopeltisantonii* Sign. (Plate 1) (Heteroptera: Miridae) is the most noxious insect pest that assumes major pest status in south and central India. It is now noticed as an emerging pest in guava in many areas with life cycle of about 30–35 days

Adults and nymphs suck the sap from young leaves, tender shoots (Plate 2), flower buds (Plate 3) and fruits (Plate 4). If the fruits are young, they dry up and drop down (Puttarudraiah, 1952). Damage to the leaves and shoots cause drying and withering of shoots. Black specks are noticed on the flower buds, which later coalesce and dry up. On fruits, with the maturation, the feeding punctures expand and results in corky formation affecting the marketable yield. Due to this, a maximum of 61.79 per cent fruit loss has been reported (Patil and Naik, 2004). Deformation and extensive drying up of flower buds, old and bigger fruits are noticed due to severe bug infestation.

On Guava, the information with regards to seasonal incidence of tea mosquito bug is lacking. Hence, the incidence pattern of tea mosquito bug was studied by making observations in the guava orchard at Agricultural Research Station (ARS), Hagari, Ballari, Karnataka during 2019-20 and 2020-21.

Plate 1: Adult tea mosquito bug, *Helopeltis antonii* Signoret

Plate 2: Drying of twigs due to tea mosquito bug

Plate 3: Flower buds affected by tea mosquito bug

Plate 4: Infestation on fruit caused by tea mosquito bug

MATERIAL AND METHODS

Observations were made on per cent damage inflicted by the bug on various parts of the plant. The methodology for estimation of damage was as follows. In the garden, ten plants were randomly selected and five branches were tagged in each selected plant. Observations were made on total number of both affected and healthy parts *viz.*, young leaves, flower buds and fruits of the plants at fortnightly interval commencing from June 2019 to May 2021. Using sweep method, the adult and nymphal populations were also assessed by making 5 sweeps per tree using hand net.

Hence the fortnightly observations were recorded on,

Total number of bugs (Adult + Nymph) per sweep.

Total number of young leaves/ branch

Total number of affected young leaves/ branch

Total number of flower buds/ branch

Total number of affected flower buds/ branch

Total number of fruits/ branch

Total number of affected fruits/ branch

The data so obtained was converted into per cent damage using following formula:

$$\text{Per cent pest damage} = \frac{\text{No. of young leaves/flower buds/fruits damaged}}{\text{Total no. of young leaves/flower buds/fruits observed}} \times 100$$

Data representation was done by plotting the data for parameters observed against time. Correlation among the parameters measured was statistically compared using Pearson Correlation Coefficients and Stepwise regression analysis was performed between *H. antonii*population (dependent variable) and the weather parameters measured using PC-SAS (Anonymous, 1999).

RESULTS AND DISCUSSION

Infestation on young leaves

The infestation on young leaves by the bug started from July 2019 second fortnight (4.85%). There was constant increase in the level of infestation in the consecutive months and recorded peak infestation of 17.33 per cent during October second fortnight. The infestation persisted for another month and found unnoticed from December 2019 to June 2020 (Table 1).

However, during 2020-21, the infestation on young leaves was noticed during July first fortnight (8.21%) which gradually increased with its peak infestation of 21.46 per cent during September second fortnight. From then, there was decreasing trend and the infestation was last observed during November second fortnight (7.33%). The pooled data of two years revealed that the pest incidence started appearing during July first fortnight (4.11%) and recorded peak (18.59%) during first fortnight of October (Table 2).

Infestation on flower buds

The bug started infesting the flower buds from first fortnight of August 2019 (5.91%). The level of infestation went on increasing in subsequent months by reaching peak infestation (15.48%) during October 2019 second fortnight. Afterwards, the infestation level started decreasing and was nil from December 2019 to July 2020.

The present study (2020-21) showed similar kind of infestation from August 2020 first fortnight to end of November 2021. There was absolutely no flower bud infestation from December 2020 to May 2021 study period. Observation on two years data showed the initiation of pest incidence during August first fortnight (8.29 %) and peaked (15.90 %) during October first fortnight.

Infestation on fruits

Infested fruits were noticed from first fortnight of August 2019 which recorded 9.23 per cent of damaged fruits. The infestation level went on increasing till the end of October 2019 (23.76%) which coincides with peak fruiting period. There after there was decline in fruit infestation and terminated by the end of December 2019. No infestation was recorded from January 2020 to July 2020. Similar trend of fruit infestation was noticed during subsequent year which recorded infestation from August first fortnight (8.55%), reached its peak (22.84 %) during October second

fortnight and was nil infestation after December second fortnight (Table 1). The perusal of pooled data reveals that the activity of pest started (8.89 %) in first fortnight of August, increased gradually over months and peak (23.30 %) infestation was noticed during second fortnight of October (Table 2). It was observed that the overall infestation level on young leaves, flower buds and fruits was higher during 2020-21 as compared to 2019-20.

The data on both years of study clearly indicates that the activity of pest followed by infestation starts during August and continued till November. The pest prevalence is more pronounced in those four months which warrants management measures to curtail the economic lossess.

Adult / nymphal population of the bug

The adult / nymphal population of *Helopeltis*spp. was observed during crop infestation period, *i.e.* from August to November months of 2019 and 2020. No record of bug population was found during rest of the months of the study period on guava. Peak population of bugs was noticed during October months of 2019 and 2020 (6 and 7 bugs/10 trees, respectively). The population was considerably least (3 bugs/ 10 trees) during August first fortnight and November month of 2019. Similarly, the population was less (3 bugs / 10 trees) during August first fortnight and November second fortnight of 2020 (Table 1). Pooled data of two years revealed the peak activity of pest population during October second fortnight (6.5 bugs/ 10 trees) (Table 2).

Table 1: Seasonal incidence of *Helopeltis*spp. on guava cv. Lucknow-49 at ARS, Hagari (Ballari) during 2019-20 and 2020-21

Year/ Month	Fortnight	Young leaves damage (%)	Flower bud damage (%)	Fruit damage (%)	Adult / Nymphal population / 10 trees (5 sweeps/tree)
2019 June	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
July	I	0.0	0.0	0.0	-
	II	4.85	0.0	0.0	-
August	I	6.51	5.91	9.23	3
	II	9.38	7.25	15.87	4
September	I	13.25	9.36	16.25	4
	II	15.70	10.55	20.33	5
October	I	16.84	12.73	21.10	6
	II	17.33	15.48	23.76	6
November	I	9.15	9.33	19.45	3
	II	5.62	4.12	12.92	3
December	I	0.0	0.0	9.66	-
	II	0.0	0.0	4.30	-
2020 January	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
February	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
March	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
April	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
May	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
June	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
July	I	8.21	0.0	0.0	-
	II	11.24	0.0	0.0	-
August	I	13.83	10.66	8.55	3
	II	16.92	12.35	15.92	5
September	I	19.54	15.92	18.25	5
	II	21.46	16.18	21.68	5
October	I	20.33	19.06	22.33	6
	II	16.74	14.33	22.84	7
November	I	8.55	7.25	16.92	4
	II	7.33	5.96	15.10	3
December	I	0.0	0.0	8.45	0
	II	0.0	0.0	3.66	0
2021 January	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
February	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
March	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
April	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-
May	I	0.0	0.0	0.0	-
	II	0.0	0.0	0.0	-

Table 2: Seasonal incidence of *Helopeltis*spp. on guava, cv. Lucknow-49 at ARS, Hagari during (Ballari) 2019-20 and 2020-21 (Pooled data of two years)

Year	Month	Fortnight	Young leaves damage (%)	Flower bud damage (%)	Fruit damage (%)	Adult / Nymphal population / 10 trees (5 sweeps/ tree)
2019 and 2020	June	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-
	July	I	4.11	0.0	0.0	-
		II	8.05	0.0	0.0	-
	August	I	10.17	8.29	8.89	3.0
		II	13.15	9.80	15.90	4.5
	September	I	16.40	12.64	17.25	4.5
		II	18.58	13.37	21.01	5.0
	October	I	18.59	15.90	21.72	6.0
		II	17.04	14.91	23.30	6.5
	November	I	8.85	8.29	18.19	3.5
		II	6.48	5.04	14.01	3.0
	December	I	0.0	0.0	9.06	-
		II	0.0	0.0	3.98	-
2020 and 2021	January	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-
	February	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-
	March	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-
	April	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-
	May	I	0.0	0.0	0.0	-
		II	0.0	0.0	0.0	-

Correlation studies and regression analysis between fruit infestation and weather parameters

During 2019-20, the average fruit infestation caused by tea mosquito bug was correlated with various weather parameters. Among them, the significant negative correlation was observed for maximum temperature (r=-0.585**). Minimum temperature also showed negative correlation (-0.033) and was non-significant. However, relative humidity and rainfall showed significant and positive correlation for pest activity with r values of 0.651** and 0.669**, respectively (Table 3).

Regression analysis indicated R^2 value of 0.672, inferring that 67.20 per cent influence of abiotic factors on the infestation level of tea mosquito bug. The multiple regression equation representing the contribution/ influence of various weather parameters and fruit infestation is as follows (Table 3).

$$Y=64.976+(-2.125)X_1+0.989X_2+(-0.132)X_3+0.071X_4+5.401$$

Similar trend was observed during 2020-21 with significant negative correlation for maximum temperature (r=-0.551). However, there was significant positive correlation with respect to minimum temperature (r=0.534). Even though relative humidity and rainfall were positively correlated to fruit infestation, relative humidity was significantly influenced and rainfall was in significantly influenced (Table 4). The influence of various weather parameters on the fruit infestation was fitted with regression analysis which documented the weather parameters influence to the tune of 40.4 per cent as indicated below (Table 4).

$$Y=40.272+(-1.208)X_1+0.759X_2+(-0.093)X_3+(-0.012)X_4+7.408$$

Correlation study and regression analysis for the pooled data of two years showed similar results with negative correlation for maximum temperature (r=-0.579). Even though there was positive correlation for minimum temperature (r=0.405) with respect to fruit infestation, it was non-significant. Both relative humidity and rainfall showed significant positive correlation (r=0.582 and r=0.569 respectively) towards pest infestation on fruits (Table 5).

Regression analysis indicated R^2 value of 0.540, indicating 54.00 per cent influence of weather parameters on the fruit infestation level caused by tea mosquito bug. The multiple regression equation fitted with weather parameters and per cent fruit infestation is as follows (Table 5).

$$Y = 74.362+(-1.864) \times var2+(0.565) \times var3+(0.262) \times var4 + (0.074) \times var5 + 6.469$$

Table 3: Correlation between the average fruit infestation due to *Helopeltis*spp. and weather parameters in Ballari during 2019-20

Sl. No.	Weather parameters	Correlation coefficient	Regression coefficient	R^2 value	Contribution (%)	Regression equation
1	Maximum temperature (X_1)	-0.585**	-2.125	0.672	67.2	Y (Fruit infestation) = 64.976 + (-2.125) **x** var2 + (0.989) **x** var3 + (-0.132) **x** var4 + (0.071) **x** var5 + 5.401
2	Minimum temperature (X_2)	-0.033	0.989			
3	Relative humidity (X_3)	0.651**	-0.132			
4	Rainfall (X_4)	0.669**	0.071			

**** Significant at 0.05 level**

Table 4: Correlation between the average fruit infestation due to *Helopeltis*spp. and weather parameters in Ballari during 2020-21

Sl. No.	Weather parameters	Correlation coefficient	Regression coefficient	R^2 value	Contribution (%)	Regression equation
1	Maximum temperature (X_1)	-0.551**	-1.208	0.404	40.40	Y (Fruit infestation) = 40.272 + (-1.208) **x** var2 + (0.759) **x** var3 + (-0.093) **x** var4 + (-0.012) **x** var5 + 7.408
2	Minimum temperature (X_2)	0.534**	0.759			
3	Relative humidity (X_3)	0.463**	-0.093			
4	Rainfall (X_4)	0.152	-0.012			

**** Significant at 0.05 level**

Table 5: Correlation between the average fruit infestation due to *Helopeltis*spp. and weather parameters in Ballari during 2019-20 and 2020-21 (Pooled)

Sl. No.	Weather parameters	Correlation coefficient	Regression coefficient	R2 value	Contribution (%)	Regression equation
1	Maximum temperature (X_1)	-0.579**	-1.864	0.540	54.00	Y (Fruit infestation) = 74.362 + (-1.864) x var2 + (0.565) x var3 + (0.262) x var4 + (0.074) x var5 + 6.469
2	Minimum temperature (X_2)	0.405	0.565			
3	Relative humidity (X_3)	0.582**	0.262			
4	Rainfall (X_4)	0.569**	0.074			

**** Significant at 0.05 level**

Observation for two years revealed that the peak infestation on young leaves (18.59 %), flower buds (15.90 %) and fruits (23.30 %) was recorded during October month (Fig. 1). Correlation studies on impact of weather parameters on fruit infestation revealed that, there was significant negative correlation with respect to maximum temperature. However, relative humidity and rainfall were significantly positive correlated with respect to fruit infestation. These results were true for both 2019-20 and 2020-21 years.

In general, the activity of tea mosquito bug on guava was noticed during July to November months. This period was coincided by presence of preferred plant parts *viz.*, young leaves, flower buds and fruits by the pest. Once the cropping season of guava was completed, the pest switched over to other alternate hosts (December to May months) near the vicinity in order to carry over the life cycle. Once the guava crop started flushing during monsoon, the pest again switched back to the main host and continued their activity.

The present findings are in accordance with the results of Onkarappa (1993) and Sunilkumar (2000) and Anandkumar *et al.* (2022) who reported that the incidence of tea mosquito bug persisted from July to October on guava. Patil and Naik (2004) observed the maximum pest infestation on guava plant parts during October month, which declined further and no damage was encountered from December onwards. Ganga and Swathi (2016) and Aravinthraju *et al.* (2022) reported that the pest occurs on guava during flushing and fruiting season from May to November.

The results pertaining to the correlation studies are in line with the findings of Kalita *et al.* (2018) and Manasa *et al.* (2020) who reported that, relative humidity, minimum temperature and total rainfall were significantly positive correlated with respect to *Helopeltistheivora* infestation on red cherry pepper. However, maximum temperature was positively correlated but was insignificant.

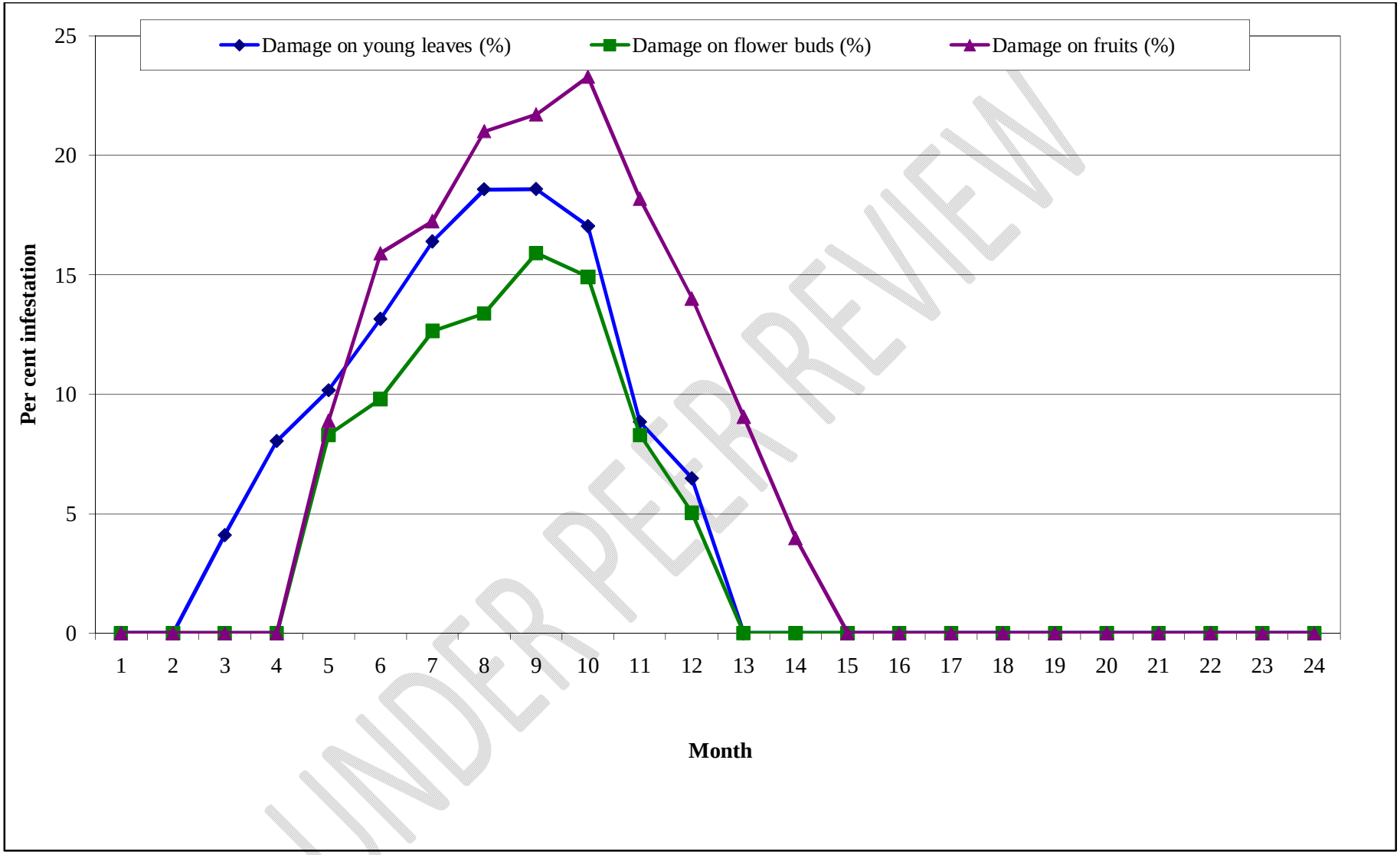

Fig 1 : Graph showing infestation (%) in different months

CONCLUSION

From the present investigation, it can be deduced that, incidence of *Helopeltis*spp. on guava persisted from July to December months. The peak infestation on young leaves, flower buds and fruits was observed during October month. Correlation studies on impact of weather parameters on infestation level of tea mosquito bug revealed significant negative correlation with respect to maximum temperature. However, relative humidity and rainfall were significantly positive correlated.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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