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Short Note

Evaluation of New Genotypes and Commercial Hybrids of Chilli for their Reaction to Thrips and Mites Under Irrigated Ecosystem of Upper Krishna Project Command Area

T. Nagaraja* and A.G. Sreenivas
Department of Agricultural Entomology,
University of Agriculture Sciences, Raichur - 584 101, Karnataka

New genotypes and popular commercial hybrid chilli were evaluated in comparison with popular varieties *viz.,* Byadagi Dabbi and Byadagi Kaddi. Among new genotype tested, G10, G_{11}, G_{20}, Bejosheetal Savitri, Bejosheetal Garima and Ujala were tolerant to thrips and mites. These genotypes recorded minimum number of thrips and mites per leaf that resulted in lower Leaf Curl Index (LCI), compared to Byadagi Dabbi, Kaddi and Guntur-4 which were susceptible to both the sucking pests under irrigated ecosystem of Upper Krishna Project (UKP) command area.

Key words: Chilli, *Polyphagotarsonemus latus,Scirtothrips dorsalis.*

Chilli (*Capsicum annuum* L.) popularly known as 'red pepper' is a tropical and subtropical crop grown all over India. It is one of the most important commercial spice and vegetable crops, earning valuable foreign exchange for the country. It was introduced to India, Indonesia and other parts of Asia around 400- 500 years ago by Portuguese traders (Berkeand Sheih, 2000). Chilli requires a warm humid climate and well drained loamy soils rich in organic matter for its cultivation.

India is the largest producer of chillies in the world. Though, it is grown all over the country, the major states producing chilli are Andra Pradesh, Karnataka and Maharashtra. These states along with Orissa, Rajasthan, Tamil Nadu and West Bengal account for 85.80 and 89.30 per cent of area and production respectively in the country. India during 2009-10 produced about 1385 thousand tonnes of chilli from an area of 812 thousand hectares. In Karnataka during 2005-06, chilli was grown in an area of 69880 hectares with an overall production of 94500 tonnes of dry chilli. The important chilli growing districts in Karnataka are Haveri, Dharwad, Gadag, Koppal, Belgaum, Gulbarga, Bagalkot, Bellary and Raichur of which only Haveri, Dharwad and Gulbarga make up 72 and 60 per cent of Karnataka states total area and production respectively.

In order to avoid the pesticidal toxicity it is imperative to resort to other non-chemical approaches of pest management strategies such as cultural practices, and resistant genotypes, use of organic amendments, botanical pesticides and bioagents which are ecofriendly and completely safe to the consumers. Plant resistance itself saves the crop from the insect damage and consequent pesticide pollution in environment. With a view to assess the resistance levels of new chilli genotypes, this experiment was conducted under Upper Krishna Project (UKP) command area.

Material and Methods

Response of 30 genotypes to mites and thrips was studied under field condition at Agricultural College Farm, Bheemarayanagudi during *Kharif* season 2006 -07. Thirty genotypes were sown in the main field on 12_{th} of August, 2006 in a plot size of 5.25 x 4.5 m and with a spacing of 75 x 45 cm. All the recommended agronomic practices were followed to raise the genotypes (Anon., 2004). The selected genotypes were screened for thrips and mites individually and together. Hence the genotypes were sown separately in three blocks. The first block of genotypes was to screen them against thrips alone (sprayed with acaricides when mite population was noticed), the second set was to screen the genotypes against mites (sprayed with insecticides when thrips population were noticed) and the third set of genotypes was meant for screening against both thrips and mites (no control measures were taken to manage thrips and mites). However, all the genotypes in all the three blocks were protected from fruit borers (*Helicoverpa* and *Spodoptera*) and diseases by spraying the selective insecticides like novaluron 10 EC @ 0.75 ml and thiodicarb 75 WP @1.0 g /l and fungicides.

Leaf Curl Index (LCI)

Leaf curl index reflecting the degree of foliage injury caused by *Polyphagotarsonemus latus* and *Scirtothrips dorsalis* was calculated as suggested by Niles (1980) for spider mites infesting cotton.

*Corresponding author email: nagu.entomology@gmail.com

The leaf curl index was calculated by multiplying the damage score by the number of plants in that category and the sum of the products was divided by total number of plants in a particular genotype. For this purpose, individual plants of each entry were rated the scale as below.

Grouping of genotypes

A preliminary classification of the genotypes resistant / tolerant against *P. latus* and *S.dorsalis* attack was done by adopting two ways frequency laid with the help of M-stat C statistical software and the genotypes were classified as follows:1-Resistant, 2- Moderately resistant, 3-Susceptible, 4-Highly susceptible.

Results and Discussion

Reaction of genotypes for thrips

Among 30 different genotypes screened, the genotypes *viz.,* G_{10}, G_{11}, G_{20}, Bejosheetal Savitri, Bejosheetal Garima and Ujala recorded relatively lower mean thrips population of 3.62, 3.62, 3.86, 3.81, 3.73 and 3.74 per leaf and 2.18, 2.21, 2.20, 2.17, 2.24 and 2.23 LCI respectively (Table 1). The remaining genotypes recorded significantly higher mean population and damage. The susceptible checks like Byadagi Dabbi, Byadagi Kaddi and Guntur-4 registered 5.81, 5.80 and 5.73 per leaf with 3.13, 2.90 and 2.90 LCI respectively. With respect to the yield performance, highest dry chilli of 26.55 q/ha was harvested from Bejosheetal Savitri which was at par with Bejosheetal Garima (25.24 q/ha) and Ujala (24.30 q/ha). Among Gangavathi lines, G_{10} registered maximum dry chilli yield (25.88 q/ha) which was on par with G_{11} (25.27 q/ha) and G_{20} (25.39 q/ha).All the above six genotypes were statistically at par.

Reaction of genotypes to mites

Data on mean mites population and LCI showed no statistical difference among many genotypes. However, the Gangavathi lines like G_{10}, G_{11} and G_{20} recorded minimum mites population of 5.52, 5.68 and 6.15 per leaf with LCI of 0.99, 1.07 and 0.98, respectively. All the commercial hybrids, Bejosheetal Savitri, Bejosheetal Garima and Ujala recorded lowest mite population of 5.63, 5.72 and 5.73 per leaf and LCI of 0.98, 0.98 and 0.99 respectively (Table

Table 1. Thrips and mite population in chilli genotypes

Genotypes	Mean thrips population, LCI and yield where mite kept under check			Mean mite population, LCI and yield where thrips kept under check			Mean population thrips and mites, LCI and yield where no control measures taken				
	Population of thrips	LCI	yield	Population of mites	LCI	yield	Population of thrips	Population of mites	LCI	LCI	yield
G1	5.15$_{b}$	2.85$_{b}$	18.49$_{def}$	9.84 (4.60)$_{b}$	1.35 (2.46)$_{bc}$	20.36$_{j}$	5.33$_{de}$	12.04 (3.98)$_{b}$	2.87$_{b}$	1.74 (2.01)$_{b}$	13.56$_{cdefg}$
G2	5.09$_{b}$	2.90$_{b}$	17.84$_{ef}$	9.91 (4.62)$_{b}$	1.41 (2.47)$_{bc}$	20.32$_{j}$	5.36$_{de}$	12.22 (4.00)$_{b}$	2.83$_{b}$	1.79 (2.15)$_{b}$	13.67$_{cdefg}$
G3	5.19$_{b}$	2.97$_{b}$	18.63$_{def}$	9.81 (4.60)$_{b}$	1.45 (2.48)$_{c}$	21.19$_{ij}$	5.31$_{de}$	12.04 (3.98)$_{b}$	2.82$_{b}$	1.80 (2.15)$_{b}$	13.04$_{efg}$
G4	5.26$_{b}$	2.98$_{b}$	18.37$_{def}$	9.80 (4.60)$_{b}$	1.47 (2.48)$_{c}$	20.10$_{j}$	5.34$_{de}$	12.20 (4.00)$_{b}$	2.79$_{b}$	1.75 (2.14)$_{b}$	12.56$_{efg}$
G5	5.28$_{b}$	2.95$_{b}$	19.55$_{de}$	9.90 (4.62)$_{b}$	1.42 (2.37)$_{abc}$	23.64$_{defgh}$	5.30$_{de}$	12.36 (4.02)$_{b}$	2.85$_{b}$	1.79 (2.15)$_{b}$	12.42$_{efg}$
G6	5.21$_{b}$	2.87$_{b}$	18.42$_{def}$	9.88 (4.62)$_{b}$	1.44 (2.47)$_{bc}$	22.43$_{fghij}$	5.19$_{de}$	12.33 (4.01)$_{b}$	2.79$_{b}$	1.78 (2.15)$_{b}$	13.07$_{efg}$
G7	5.16$_{b}$	2.93$_{b}$	19.44$_{de}$	9.82 (4.60)$_{b}$	1.33 (2.38)$_{abc}$	24.76$_{def}$	5.41$_{de}$	12.38 (4.02)$_{b}$	2.78$_{b}$	1.82 (2.16)$_{b}$	12.31$_{efgh}$
G8	5.18$_{b}$	3.00$_{b}$	20.55$_{cd}$	9.78 (4.59)$_{b}$	1.43 (2.46)$_{bc}$	24.14$_{defg}$	5.25$_{de}$	12.34 (4.02)$_{b}$	2.81$_{b}$	1.77 (2.14)$_{b}$	13.29$_{defg}$
G9	5.14$_{b}$	2.99$_{b}$	21.58$_{c}$	9.88 (4.61)$_{b}$	1.47 (2.47)$_{bc}$	24.37$_{defg}$	5.37$_{de}$	12.27 (4.01)$_{b}$	2.85$_{b}$	1.80 (2.15)$_{b}$	14.48$_{bcdef}$
G10	3.62$_{a}$	2.18$_{a}$	25.88$_{ab}$	5.52 (3.70)$_{a}$	0.99 (2.24)$_{a}$	28.26$_{ab}$	4.30$_{b}$	9.13 (3.59)$_{a}$	2.25$_{a}$	1.17 (1.93)$_{a}$	16.58$_{abc}$
G11	3.62$_{a}$	2.21$_{a}$	25.27$_{ab}$	5.68 (3.75)$_{a}$	1.07 (2.28)$_{ab}$	27.47$_{bc}$	3.65$_{a}$	9.53 (3.64)$_{a}$	2.28$_{a}$	1.18 (1.94)$_{a}$	16.38$_{abcd}$
G12	5.21$_{b}$	2.82$_{b}$	18.42$_{def}$	9.86 (4.61)$_{b}$	1.46 (2.48)$_{c}$	21.57$_{hij}$	4.84$_{bcd}$	12.40 (4.02)$_{b}$	2.84$_{b}$	1.82 (2.16)$_{b}$	12.45$_{efg}$
G14	5.25$_{b}$	2.89$_{b}$	17.39$_{efg}$	9.96 (4.63)$_{b}$	1.47 (2.49)$_{c}$	20.71$_{j}$	5.37$_{de}$	12.41 (4.03)$_{b}$	2.84$_{b}$	1.80 (2.15)$_{b}$	8.69$_{i}$
G15	5.26$_{b}$	3.00$_{b}$	17.96$_{ef}$	9.99 (4.63)$_{b}$	1.41 (2.49)$_{c}$	23.18$_{efghi}$	5.35$_{de}$	12.57 (4.03)$_{b}$	2.82$_{b}$	1.82 (2.16)$_{b}$	11.41$_{fghi}$
G16	5.83$_{b}$	2.94$_{b}$	17.37$_{efg}$	9.87 (4.61)$_{b}$	1.57 (2.50)$_{c}$	23.86$_{defgh}$	5.35$_{de}$	12.49 (4.03)$_{b}$	2.86$_{b}$	1.79 (2.15)$_{b}$	11.97$_{efgh}$
G17	5.75$_{b}$	3.07$_{b}$	19.01$_{de}$	9.76 (4.59)$_{b}$	1.47 (2.49)$_{abc}$	23.52$_{defghi}$	5.43$_{de}$	11.74 (3.94)$_{b}$	2.85$_{b}$	1.79 (2.17)$_{b}$	12.59$_{efg}$
G18	5.78$_{b}$	2.93$_{b}$	17.95$_{ef}$	9.86 (4.60)$_{b}$	1.23 (2.38)$_{abc}$	22.39$_{fghij}$	5.34$_{de}$	12.25 (4.01)$_{b}$	2.79$_{b}$	1.89 (2.19)	11.04$_{ghi}$
G19	5.74$_{b}$	2.85$_{b}$	19.39$_{de}$	9.79 (4.70)$_{b}$	1.41 (2.48)$_{c}$	24.36$_{defg}$	5.40$_{de}$	12.24 (4.00)$_{b}$	2.74$_{b}$	1.84 (2.17)$_{b}$	11.93$_{efgh}$
G20	3.86$_{a}$	2.20$_{a}$	25.39$_{ab}$	6.15 (3.86)$_{a}$	0.98 (2.22)$_{a}$	27.85$_{abc}$	4.58$_{bc}$	9.35 (3.62)$_{a}$	2.24$_{a}$	1.17 (1.93)$_{a}$	17.02$_{ab}$
G21	5.79$_{b}$	2.93$_{b}$	15.11$_{hij}$	9.82 (4.60)$_{b}$	1.45 (2.49)$_{c}$	22.30$_{fghij}$	4.45$_{b}$	12.21 (4.00)$_{b}$	2.79$_{b}$	1.71 (2.13)$_{b}$	13.95$_{bcdefg}$
G22	5.80$_{b}$	2.91$_{b}$	18.50$_{def}$	9.91 (4.62)$_{b}$	1.48 (2.49)$_{c}$	25.81$_{cd}$	5.35$_{de}$	12.09 (3.99)$_{b}$	2.84$_{b}$	1.78 (2.15)$_{b}$	14.62$_{abcdef}$

Table cont..

G23	5.80$_{b}$	3.00$_{b}$	17.47$_{efg}$	10.03 (4.64)$_{b}$	1.47 (2.47)$_{bc}$	25.26$_{de}$	5.55$_{de}$	12.29 (4.01)$_{b}$	2.85$_{b}$	1.78 (2.15)$_{b}$	15.12^{abcde}
G24	5.74$_{b}$	2.90$_{b}$	15.63$_{ghi}$	9.84 (4.61)$_{b}$	1.45 (2.50)$_{c}$	24.02$_{defg}$	5.56$_{de}$	12.57 (4.04)$_{b}$	2.76$_{b}$	1.80 (2.16)$_{b}$	10.78$_{ghi}$
G25	5.82$_{b}$	2.95$_{b}$	16.72$_{fgh}$	9.91 (4.62)$_{b}$	1.50 (2.51)$_{c}$	22.08$_{ghij}$	5.56$_{de}$	12.83 (4.07)$_{b}$	2.72$_{b}$	1.76 (2.14)$_{b}$	12.42$_{efg}$
Byadagi dabbi	5.81$_{b}$	3.13$_{b}$	14.30$_{ij}$	10.22 (4.60)$_{b}$	1.48 (2.48)$_{c}$	17.08$_{k}$	5.60$_{de}$ (4.04)$_{b}$	12.55	2.78$_{b}$ (2.13)$_{b}$	1.73	9.19$_{hi}$
Byadagi kaddi	5.80$_{b}$	2.90$_{b}$	13.31$_{j}$	9.91 (4.62)$_{b}$	1.34 (2.51)$_{c}$	16.16$_{k}$	5.60$_{de}$	12.59 (4.04)$_{b}$	2.78$_{b}$	1.78 (2.15)$_{b}$	8.38$_{i}$
Guntur-4	5.73$_{b}$	2.90$_{b}$	17.84$_{ef}$	9.87 (4.61)$_{b}$	1.39 (2.49)$_{c}$	21.15$_{ij}$	5.62$_{e}$	12.34 (4.02)$_{b}$	2.75$_{b}$	1.79 (2.15)$_{b}$	11.42$_{fghi}$
Bejosheetal Savitri	3.81$_{a}$	2.17$_{a}$	26.55$_{a}$	5.63 (3.73)$_{a}$	0.98 (2.23)$_{a}$	30.11$_{a}$	3.65$_{a}$	9.30 (3.61)$_{a}$	2.19$_{a}$	1.16 (1.92)$_{a}$	17.69$_{a}$
Bejosheetal Garima	3.73$_{a}$	2.24$_{a}$	25.24$_{ab}$	5.72 (3.76)$_{a}$	0.98 (2.25)$_{a}$	29.73$_{ab}$	3.61$_{a}$	9.27 (3.61)$_{a}$	2.24$_{a}$	1.18 (1.93)a	15.12$_{abcde}$
Ujala	3.74$_{a}$	2.23$_{a}$	24.30$_{b}$ (3.76)$_{a}$	5.73 (2.25)$_{a}$	0.99	29.14$_{ab}$	3.65$_{a}$ (3.60)$_{a}$	9.22	2.21$_{a}$ (1.94)$_{a}$	1.19	16.47$_{abc}$
S.Em±	0.24	0.18	0.66	0.16	0.07	0.73	0.27	0.15	0.17	0.05	0.95

DAS : Days after sowing G : Gangavathi lines; In vertical columns means followed by similar letters are non significant (P = 0.05) by DMRT.
* Figures in the parenthesis are (x+1) values

1). The dry chilli yield obtained from plots infested by mites was comparatively more than plots infested by thrips. This might be mainly due to more severe damage caused by thrips on chilli than mite. Bejosheetal Savitri registered highest dry chilli yield of 30.11 q /ha, which was on par with Bejosheetal Garima (29.73 q/ha) and Ujala (29.14 q/ha). Among Gangavathi lines G_{10}, G_{11} and G_{20} were found resistant by registering 28.26, 27.47 and 27.85 q per ha respectively.

Reaction of genotypes to both thrips and mite

Among the different genotypes tested, the genotypes G_{10}, G_{11}, G_{20}, Bejosheetal Savitri, Bejosheetal Garima and Ujala recorded relatively lower thrips population of 4.30, 3.65, 4.58, 3.65, 3.61 and 3.65 per leaf with LCI of 2.25, 2.28, 2.24, 2.19, 2.24 and 2.21 respectively and rest of the Gangavathi lines and Byadagi Dabbi, Byadagi Kaddi and Guntur-4 recorded significantly higher thrips population and correspondingly more LCI. Observations on mean mite population per leaf and its damage also showed similar trend, whereas, commercial hybrids like Bejosheetal Savitri, Bejosheetal Garima, Ujala, Gangavathi lines *viz.,* G_{10}, G_{11} and recorded relatively lower population and its damage (LCI) and proved to be resistant lines. The commercial hybrids *viz.,* Bejosheetal Savitri recorded significantly higher dry chilli yield (17.69 q/ha), followed by Bejosheetal Garima (15.12 q/ha) and Ujala (16.47 q/ha). G_{10}, G_{11} and G_{20} recorded dry chilli yield of 16.58, 16.38 and 17.02 q/ha, respectively and they were on par with each other. But rest of the genotypes registered significantly low dry chilli yield.Crop cultivars that exhibited differential plant characters *viz.,* hairiness, leaf surface, succulence, biochemical components *etc.*, may impart resistance to pests.Trichome density of leaves, phenols, etc. also cause insects not to feed on the plants as reported by Rajaram *et al.* (2001). Singh (1998) reported that some of the biochemical components act as defensive substances against sucking pests of chili. Sontakke (1984) reported that Pant C-1, CA-996 and Musalwadi selections were much popular and cultivated by the farmers as they were tolerant to major pests tolerant. Borah (1987) reported G-4, K-3435, IC-24243 varieties as promising. Tembheurne *et al.* (2004) reported that hybrid Tejaswini performed better with respect to yield and showed resistance to *murda* complex. Gayathridevi (2006) noticed that Guntur-4, Pusa Jwala and hybrid, Tejaswini recorded less population of mites, thrips and the lowest leaf curl index and proved tolerant to pest damage.

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