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INCIDENCE OF ONION THRIPS *THRIPS TABACI* LINDEMAN IN SOME CABBAGE VARIETIES IN KOSOVO

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ABSTRACT

Onion thrips (*Thrips tabaci* Lindeman) is a serious pest of cabbage worldwide. This study assesses the distribution of this thrips in three cabbage varieties (Proctor, Partula, and Atria) cultivated in open fields in three localities of Kosova (Barilevë, Prishtinë, and Podujevë). The experiment was conducted during 2020 and 2021 in randomized Fisher blocks design with four replications. Observations on the incidence of thrips confirmed with yellow sticky traps measuring 15x 20 cm revealed statistically significant differences with regard to years, localities, and varieties. This study reveals for the first time, the occurrence of *T. tabaci* on cabbage varieties cultivated in Kosovo.

Key words: *Thrips tabaci*, cabbage varieties, Atria, Partula, Proctor, incidence, ANOVA, number of thrips, yellow sticky traps, population buildup, variation

Onion thrips *Thrips tabaci* Lindeman (Thysanoptera: Thripidae), is a worldwide distributed insect pest of economic importance (Diaz Montano et al., 2011; Fail, 2016). Direct feeding causes economic damage to over 300 host plant species, causing U.S. $1 billion in crop losses (Balan et al., 2018). Besides causing direct damage, this pest has been known as a vector of two economically significant viral pathogenes, tomato spotted wilt virus (TSWV), and Iris yellow spot virus (IYSV). It is estimated that IYSW causes annual losses of U.S. $90 million to onion production in the western USA alone (Gent et al., 2006), whereas TSWV can cause over U.S $1 billion in crop losses annually worldwide (Goldbach and Peters, 1995). Onion thrips damage the white cabbage (*Brassica oleracea* L.) outdoors (Wolfenbarger and Hibbs, 1958) and in storage as well (Fox and Delbridge, 1977). Damage can appear as a bronze discoloration and/ or a rough texture on leaves within heads (Shelton and North, 1986), causing injury up to 20 layers deep (Trdan et al., 2005) and reducing marketable yield.

The use of insecticides usually results in poor control of onion thrips on cabbage (Andaloro et al., 1983), and a high amount of insecticides is required because of their high escape capacity, fast development rate, and low sensitivity to the insecticides. On the other hand, few studies have been carried out to evaluate the patterns of resistance of cabbage varieties against onion thrips. Three different mechanisms of plant resistance to insects have been defined 1) non-preference (antixenosis), 2) antibiosis, and 3) tolerance (Painter, 1941). Based on the number of thrips colonizing the cabbage heads, Fail et al. (2008) reported that only some varieties possess antixenotic resistance. Despite several studies, the resistance mechanisms of cabbage to onion thrips remains unknown (Shelton et al., 2008). Taking into consideration the fact that *T. tabaci* is a serious threat to cabbage production worldwide (Shelton et al., 1983; Giessmann, 1988; Kristof and Penzes, 1984; Kahrer, 1992; Herold and Stengel, 1993; Ellis et al., 1994), the main goal of this work was to assess its buildup and population dynamics in three cabbage varieties grown in open fields in the three localities of Kosova during two cropping seasons (2020–2021).

MATERIALS AND METHODS

Field surveys for *T. tabaci* infesting cabbage in the three most important localities of cabbage production in Kosovo (Prishtinë, Barilevë, and Podujevë) were undertaken in the 2020-2021 growing season. The fields were situated in Prishtinë (42°6882’, 21°1466’, 603 masl), Podujevë (42°8322’, 21°2081’, 636 masl) and Barilevë (42°7518’, 21°1210’, 526 masl). Three varieties of cabbage (Proctor, Partula, and Atria) were included, and these were grown under insecticide-free conditions. In May, cabbage seeds were sown in pro trays filled with vermiculite, one seed per cell, and covered with a polythene sheet until germination. After the seeds were germinated, seedlings were transplanted during June, with spacing of 60x 40 cm. Cultural practices were followed as recommended for cabbage (Filgueira, 2000). Each variety was planted in an experimental block of 1 ha, with plot size of 0.25 ha, forming four plots/ variety in each locality, and these were arranged in a randomized block design.

To assess the thrips abundance and distribution in varieties, yellow sticky traps (BB sticky trap yellow NHS- 25x 10 cm) were placed folowing Pobozniak et al. (2020). These traps were produced by Biobest Group NV, Belgium, and placed randomly 1 m apart in the middle of each plot, attached to wooden stakes in such a manner that their bottom edges were 10-15 cm above the plant heights. These traps were checked and replaced at 15-day intervals, from the beginning (July) until harvest (September). After the removal of traps, these were wrapped with clear plastic cling film, and provided with the most relevant data (date of sampling, plot number, variety, locality, etc.). These were taken to the laboratory of Plant Protection at the Faculty of Agriculture and Veterinary to identify the thrips and assess their numbers as well. At the laboratory, each trap was examined, and thrips removed from using mineral spirits, before slide mounted in drops of the Heinz solution under a stereomicroscope and identified to species level under a compound microscope, following Mound and Walker (1982). Given that climatic conditions can influence thrips buildup and distribution (Morsello et al., 2008), meteorological data from the Prishtina meteorological station were obtained. The data were statistically processed using the MSTAT-C software packages developed by the University of Michigan version 2.10, and analysed for three-way ANOVA with significance determined using LSD (p=0.05 and 0.01).

RESULTS AND DISCUSSION

The observations on the appearance and distribution of *T.tabaci* revealed its occurrence in all cabbage varieties, and their numbers varied over year, localities, and cabbage varieties (Table 1). The incidence started from the beginning of the growing season when the seedlings had just been planted and continued in the entire growing season, with high intensity. Leite et al. (2006) observed that the thrips population tends to increase in the final phase of the plant or reaches a peak in about 40 days after planting when the cabbage head is formed. Voorrips et al. (2008) concluded that cabbage suffers more damage later in the season. The frequency of appearance in varieties varied over years, with maximum (29881 individuals) during 2020; maximum incidence was in Prishtinë variety. Morsello et al. (2008) observed that temperature and precipitation can influence the thrips incidence. The varieties showed variations; Atria was the most affected, while the least affected was Partula. There were significant differences in the degree of susceptibility of some varieties like Golden Cross, Balashi, Riana, Autumn Queen, 'Leopard', Ama-Daneza', and 'Galaxy' (Fail and Penzes, 2001). Also, it has been reported that there is a large difference in thrips damage among red and white cabbage varieties (Shelton et al., 1983; Stoner and Shelton, 1988; Steene Van and Tirry, 2003; Trdan et al., 2005).

The ANOVA and LSD analyses revealed significant differences in incidence between years, localities, and varieties (Table 1). In 2020, in relation to 2021 (Factor A), where its numbers were 333.2 and 220.2 individuals, respectively; these differences are highly significant. Such differences were observed with regard to localities as well (Factor B), maximum was at Pristinë (326.2) and the least in Podujevë (246.6), and these varaitions are highly significant. Amongst the varieties (Factor C) also, highly significant differences were observed- Atria with maximum (392.6) and the least with Partula (157.8). Regarding the interactions of factors, statistically significant differences were found-, concluding that the appearance and distribution of *T. tabaci* varies considerably. With the aim of managing the *T. tabaci* in cabbage, it would be extremely useful to investigate the feasibility of an IPM strategy at the farmer level. Planting varieties with tolerance to thrips damage may serve to protect cabbages without the use of insecticides.

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AUTHOR CONTRIBUTION STATEMENT

Both authors contributed equally.

Table 1. Comparison of onion thrips distribution by localities and varieties during the two growing seasons (ANOVA)

Year (A)	Locality (B)	Variety (C)	Sampling						Sum	ANOVA						
			1	2	3	4	5	6		A	B	C	AB	AC	BC	ABC
2020 A_1	Prishtinë B_1	Proktor (C_1)	415	397	213	918	548	711	3202	A_1 333.2**	B_1 326.2**	C_1 279.6	A_1B_1 371.2*	A_1C_1 436.2**	B_1C_1 365.8	$A_1B_1C_1$ 533.7
		Partula (C_2)	210	132	97	174	49	236	898							$A_1B_1C_2$ 149.7**
		Atria (C_3)	625	718	595	627	618	569	3752						B_1C_2 131.4	$A_1B_1C_3$ 625.3**
	Barilevë B_2	Proktor (C_1)	236	201	317	294	213	322	1583				A_1B_2 166.9	A_1C_2 291.4		$A_1B_2C_1$ 263.8
		Partula (C_2)	126	174	195	245	281	194	1215						B_1C_3 481.4	$A_1B_2C_2$ 202.5
		Atria (C_3)	349	387	416	495	410	391	2448							$A_1B_2C_3$ 408.0
	Podujevë B_3	Proktor (C_1)	215	308	195	240	429	510	1897		B_2 257.1	C_2 157.8**	A_1B_3 461.4*	A_1C_3 271.9	B_2C_1 190.6 Ns	$A_1B_3C_1$ 316.2
		Partula (C_2)	28	69	155	217	104	319	892							$A_1B_3C_2$ 148.7
		Atria (C_3)	308	422	354	293	312	416	2105						B_2C_2 206.8 Ns	$A_1B_3C_3$ 350.8
2021 A_2	Prishtinë B_1	Proktor (C_1)	182	243	287	154	218	104	1188	A_2 220.2**			A_2B_1 188.0	A_2C_1 216.2**		$A_2B_1C_1$ 198.0
		Partula (C_2)	41	98	117	152	103	168	679						B_2C_3 374.0	$A_2B_1C_2$ 113.2
		Atria (C_3)	308	410	295	186	455	371	2026							$A_2B_1C_3$ 337.5
	Barilevë B_2	Proktor (C_1)	39	68	95	152	106	244	704		B_3 246.6**	C_3 392.6**	A_2B_2 148.7	A_2C_2 222.8	B_3C_1 282.4	$A_2B_2C_1$ 117.3
		Partula (C_2)	82	118	167	258	213	429	1267							$A_2B_2C_2$ 211.2
		Atria (C_3)	215	295	316	378	349	487	2040						B_3C_2 135.3	$A_2B_2C_3$ 340.0
	Podujevë B_3	Proktor (C_1)	103	255	196	233	410	295	1492				A_2B_3 323.7	A_2C_3 221.4		$A_2B_3C_1$ 248.7
		Partula (C_2)	54	116	92	51	148	270	731						B_3C_3 322.3	$A_2B_3C_2$ 121.8
		Atria (C_3)	411	352	301	297	256	145	1762							$A_2B_3C_3$ 293.7
LSD							p=0.01			42.409	62.516	54.161	98.622	85.442	111.081	190.619
							p=0.05			32.218	47.493	41.146	71.996	62.375	79.229	125.828

Note: 1-6 represents the terms of onion thrips collected from four repetitions; ** highly significant; * significant; Ns not significant.

CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

Andaloro J T, Hoy C W, Rose K B, Shelton A M. 1983. Evaluation of insecticide usage in the New York. Processing-Cabbage Pest Management Program. Journal of Economic Entomology 76(5): 1121-1124.

Balan R K, Ramasamy A, Hande R H, Gawande S J, Krishna Kumar N K. 2018. Genome-wide identification, expression profiling, and target gene analysis of microRNAs in the onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae), vectors of tospoviruses (Bunyaviridae). Ecology and Evolution 8(13): 6399-6419.

Diaz-Montano J, Fuchs M, Nault B A, Fail J, Shelton A M. 2011. Onion thrips (Thysanoptera: Thripidae): a global pest of increasing concern in onion. Journal of Economic Entomology 104(1): 1-13.

Ellis P R, Kazantzidou E, Kahrer A, Hildenhargen R, Hommes M. 1994. Preliminary field studies of the resistance of cabbage to *Thrips tabaci* in three countries in Europe. IOBC/WPRS Bulletin 17(8): 102-108.

Fail J, Penzes B. 2001. Developing methods for testing the resistance of white cabbage against Thrips tabaci. Thrips and tospoviruses: Proceedings of the 7th International Symposium on Thysanoptera, Reggio Calabria, July 2-7 2001. pp. 359-363.

Fail J, Zana J, Penzes B. 2008. The role of plant characteristics in the resistance of white cabbage to onion thrips: preliminary results. Acta Phytopathologica et Entomologica Hungarica 43(2): 267-275.

Fail J. 2016. Speciation in *Thrips tabaci* Lindeman, 1889 (Thysanoptera): the current state of knowledge and its consequences. Polish Journal of Entomology 85(1): 93-104.

Filgueira, F A R. 2000. Novo manual de olericultura. Viçosa. UFV. 402 pp.

Fox C J S, Delbridge R W. 1977. Onion thrips injuring stored cabbage in Nova Scotia and Prince Edward Island. Phytoprotection 58(2-3): 57-58.

Gent D H, Du Toit L J, Fichtner S F, Mohan S K, Pappu H R, Schwartz H F. 2006. Iris yellow spot virus: an emerging threat to onion bulb and seed production. Plant Disease 90(12): 1468-1480.

Giessmann H J. 1988. Zum Schadauftreten von *Thrips tabaci* an Kopfkohl für die Lagerung. Nachrichtenblatt für den Pflanzenschutz in der DDR 42(5): 109-110.

Goldbach R, Peters D. 1944. Possible causes of the emergence of tospovirus diseases. Seminars in Virology 5, 113-120.

Herold D, Stengel B. 1993. Les thrips sur chou à choucroute. Une situation inquiétante en Alsace. PHM Revue Horticole 336: 51-55.

Kahrer A. 1992. Monitoring the timing of peak flight activity of *Thrips tabaci* in cabbage fields. Bulletin IOBC/SROP 15(4): 28-35.

Kristóf L, Pénzes B. 1984. Parás szemölcsök fejeskáposztán (Suberized verrucae on cabbage). Kertészet és Szôlészet 33(49): 9.

Leite G L D, Picanço M, Jham G N, Moreira M D. 2006. Whitefly, aphids and thrips attack on cabbage. Pesquisa Agropecuaria Brasileira 41(10): 1469-1475.

Morsello S C, Groves R L, Nault B A, Kennedy G G. 2008. Temperature and precipitation affect seasonal patterns of dispersing tobacco thrips, Frankliniella fusca and onion thrips, Thrips tabaci (Thysanoptera: Thripidae) caught on sticky traps. Environmental Entomology 37(1): 79-86.

Mound L A, Walker A K. 1982. Terebrantia (Insecta: Thysanoptera). Fauna of New Zealand 1. 113 pp.

Painter R H. 1941. The economic value and biological significance of insect resistance in plants. Journal of Economic Entomology 34(3): 360-367.

Pobozniak M, Tokarz K, Musynov K. 2020. Evaluation of sticky trap colour for thrips (Thysanoptera) monitoring in pea crops (*Pisum sativum* L.). Journal of Plant Diseases and Protection 127(3): 307-321.

Stoner K A, Shelton A M. 1988. Effect of planting date and timing of growth stages on damage to cabbage by onion thrips (Thysanoptera: Thripidae). Journal of Economic Entomology 81(4): 1186-1189.

Shelton A M, Becker R F, Andaloro J T. (1983). Varietal resistance to onion thrips (Thysanoptera: Thripidae) in processing cabbage. Journal of Economic Entomology 76(1): 85-86.

Shelton A M, Plate J, Chen M. 2008. Advances in control of onion thrips (Thysanoptera: Thripidae) in cabbage. Journal of Economic Entomology 101(2): 438-443.

Shelton A M, North R C. 1986. Species composition and phenology of Thysanoptera within field crops adjacent to cabbage fields. Environmental Entomology 15(3): 513-519.

Trdan S, Milevoj L, Zezlina I, Raspudic E, Andjus L, Vidrih M, Bergant K, Valic, N, Znidarcic D. 2005. Feeding damage by onion thrips, *Thrips tabaci* Lindeman (Thysanoptera: Thripidae), on early white cabbage grown under insecticide-free conditions. African Entomology 13(11): 85-95.

Steene Van F, Tirry L. 2003. Monitoring the flight activity and damage of *Thrips tabaci* (Lind) in different varieties of white and red cabbage. IOBC/WPRS Bulletin 26(3): 33-37.

Voorrips R E, Steenhuis G, Tiemens-Hulscher M, Lammerts van Bueren E T. 2008. Plant traits associated with the resistance to *Thrips tabaci* in cabbage (*Brassica oleraceae* var capitata). Euphytica 163(8): 409-415.

Wolfenbarger D, Hibbs E T. 1958. *Onion thrips* (*Thrips tabaci* Lind.) infesting cabbage. Journal of Economic Entomology 51(3): 394-396.

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