

### 1.3. UZROCI ČEŠĆIH POJAVA PAMUKOVE SOVICE (*Helicoverpa armigera* Hb.)

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Pamukova sovica (*Helicoverpa armigera* Hb.) predstavlja jednu od najopasnijih štetočina gajenih biljaka u svetu (hrani se na 100-250 biljnih vrsta). Kao stanovnik tropskih i subtropskih područja u Srbiji je do 1993. godine beležena samo u malom broju primeraka. Međutim, od tada se sve češće javlja, prouzrokujući primetne štete mnogim gajenim biljkama. Njenom množenju pogoduju topli i suvi periodi vremena, ali i veća količina padavina u proleće, visoka relativna vlažnost vazduha u periodu piljenja jaja i razvoja mlađih gusenica, uz prisustvo većih površina pod kukuruzom, pamukom, duvanom, paradajzom, paprikom i mahunarkama.

Tokom XX i početkom XXI veka, masovne ili značajne pojave i štete od pamukove sovice zabeležene su tokom 34 godine u Rumuniji, 17 u Bugarskoj, 13 u Mađarskoj i 11 u Srbiji. U uzroke znatno češćih pojava u prve dve zemlje treba ubrojati velike površine pod povoljnim domaćinima za navedenu sovicu. Na primer, u Rumuniji se kukuruz gaji na preko 3 miliona ha, pamuk je sredinom prošlog veka gajen na 100 hiljada ha (sada na 1000), a znatno su povećane površine pod suncokretom (sa 500 na 800 hiljada ha), sojom (sa 20 na 90 hiljada ha), paradajzom i paprikom (sa 45 na 73 hiljade hektara). U Bugarskoj se velike površine nalaze pod duvanom i povrćem, daleko veće nego u Mađarskoj i Srbiji. Važan faktor razmnožavanja ove štetočine su i veće površine u navodnjavanju. Dok Bugarska i Rumunija navodnjavaju 21%, odnosno 6% od obradivih površina, Mađarska i Srbija navodnjavaju svega 3%, odnosno 2%. Preko Rumunije i Bugarske vode povoljniji migracioni putevi ove sovice, a nije isključeno da je usled postepenih klimatskih promena došlo i do adaptacije vrste, pa ona u većem procentu prezimljava u te dve zemlje.

Međutim, verovatno da je globalno zagrevanje atmosfere jedan od najvažnijih činilaca koji utiču na pojavu i štetnost ove izrazito migratorne vrste. Naime, u prošlom veku je za 25% povećana količina ugljen-dioksida, pa je, zbog uvećanja efekta staklene bašte, prosečna

### 1.3. CAUSES OF MASS INCIDENCE OF COTTON BOLLWORM (*Helicoverpa armigera* Hb.)

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The cotton bollworm (*Helicoverpa armigera* Hb.) is one of the most harmful pests of cultivated plants worldwide (it feeds on 100-250 plant species). This pest whose natural habitat are tropical and subtropical regions was found in Serbia only in small numbers prior to 1993. Since then, however, it has spread rapidly causing noticeable damage to many cultivated plants. The reproduction of the cotton bollworm favors warm and dry spells of weather as well as higher amounts of precipitation in the spring, high relative humidity at the time of egg hatching and young caterpillars and the presence of large areas in maize, cotton, tobacco, tomato, pepper and legumes.

During the 20th and early 21st century, mass or significant incidence and damage by the pest has been recorded for more than 34 years in Romania, 17 in Bulgaria, 13 in Hungary, and 11 in Serbia. The reason for the considerably higher incidence of the cotton bollworm in the first two countries lies in the fact that they have had large areas in crops that are favorable hosts for the cotton bollworm. In Romania, for example, maize is grown on over 3 million hectares, cotton used to be grown on 100,000 ha in the mid-20th century (nowadays it is 1,000 ha), and there has been a considerable increase of acreage in sunflower (from 500,000 to 800,000 ha), soybean (from 20,000 to 90,000 ha) and tomato and pepper (from 45,000 to 73,000 ha). Bulgaria has large areas sown to tobacco and vegetables, much larger than Serbia and Hungary. Another important factor in cotton bollworm reproduction is the existence of large irrigated areas. Bulgaria and Romania irrigate 21 and 6% of their arable land, respectively, compared with a mere 3% in Hungary and 2% in Serbia. The more favorable migratory routes of this insect go through Romania and Bulgaria and it is also not inconceivable that gradual climatic changes may have caused this species to adapt so that now it overwinters in larger numbers in both countries.

Nevertheless, it is the global warming of the atmosphere that is probably one of the most important factors influencing the occurrence and harmfulness of this highly migratory species. During the past century

temperatura vazduha porasla za  $0,8^{\circ}\text{C}$ . Najtoplja je bila poslednja decenija, na koju se nadovezao i izuzetno topao početak XXI veka. Meteorolozi predviđaju da će do 2025. godine srednja temperatura vazduha porasti za  $1^{\circ}\text{C}$ , a do kraja veka za 3 ili više stepeni. U južnoj Evropi, uz postepeno otopljavanje očekuje se i istovremeno smanjenje količine padavina u letnjem periodu, a s tim u vezi opadanje vlažnosti zemljišta, što će usloviti pomeranje oblasti gajenja važnijih biljnih vrsta ka severu naše polulopte. Ove promene će pratići i štetni organizmi, uglavnom kserotermofilni, čije su iznenadne masovne pojave moguće. Potvrda za ovo upravo se nalazi u 2003. godini, kada je masovna pojавa pamukove sovice zabeležena u Srbiji, Mađarskoj, Rumuniji, Bugarskoj i Makedoniji, a značajna u Hrvatskoj, Sloveniji, pa čak i u Austriji, Slovačkoj i Češkoj.

U periodu od 1994. do 2003. godine, utvrđena je pozitivna korelacija između prosečnih temperatura tokom juna-avgusta i broja ulovljenih leptira *H. armigera* tokom vegetacije u Vojvodini, dok je između visine padavina u istim mesecima i broja leptira ustanovljena negativna korelacija. Brojnost pamukove sovice je bila najveća u 2003. godini, kada su prosečne temperature tokom juna-avgusta bile najveće u posmatranih deset godina ( $23,6^{\circ}\text{C}$ ), broj "tropskih" dana (sa maksimalnim temperaturama preko  $30^{\circ}\text{C}$ ) takođe najveći, a količina padavina veoma mala (123 mm). Na drugom mestu po ulovu leptira je 2000. godina, u kojoj su prosečne temperature u junu-avgustu iznosile  $23,2^{\circ}\text{C}$ , broj "tropskih" dana je takođe bio velik, a suma padavina najniža u analiziranom desetogodišnjem periodu (57 mm). U 2002. godini, u kojoj su vladali slični vremenski uslovi, zabeležen je treći po visini ulov pamukove sovice. Sa druge strane, brojnost leptira je bila najmanja tokom 1997-1999. godine, kada su letnje temperature bile niže, a količina padavina veća od prosečnih.

Ukoliko se tokom XXI veka bude ostvarivala prognoza globalnog otopljavanja, koje često biva praćeno pojavom suše, mogu se očekivati češće masovne pojave pamukove sovice i drugih kserotermofilnih štetočina (skakavaca, tripsa, poljskih i žitnih stenica, pipa, buvača i dr.), kao i novih vrsta, usled proširivanja areala rasprostranjenosti nekih mediteranskih vrsta.

carbon dioxide levels increased by 25% raising the average air temperature by 0.8°C and contributing to the greenhouse effect. The last decade of the 20th century was the warmest and it was followed by an extremely warm beginning of the 21st century. Meteorologists predict that the mean air temperature will increase by 1°C by the year 2025 and by three or more degrees Celsius by the end of the century. In southern Europe, the gradual warming is expected to be accompanied by a decline in summer precipitation and, hence, soil moisture levels, which will cause the areas in which the major crop species are grown to shift to the north of our hemisphere. These changes will be followed by harmful organisms, primarily xerothermophilous ones, which may begin to occur suddenly in mass numbers. A confirmation of this may be found in the year 2003 characterized by mass incidence of the cotton bollworm in Serbia, Hungary, Romania, Bulgaria and Macedonia and significant incidence of this pest in Croatia and Slovenia and even Austria, Slovakia and the Czech Republic.

During 1994-2003 a positive correlation was recorded between the average temperatures in June-August and the number of *H. armigera*, butterflies caught during the growing season in Vojvodina, while the precipitation levels during the same months and the butterfly numbers were negatively correlated. The incidence of the cotton bollworm was the highest in 2003 with the highest average June-August temperatures over the past 10 years (23.6°C), the highest number of tropical days (those with maximum temperatures of over 30°C), and very little precipitation (123 mm). The second highest trapped butterfly count was recorded in 2000, a year with an average June-August temperature of 23.2°C, a large number of tropical days, and the lowest sum of precipitation over the ten-year period analyzed (57 mm). In 2002, under similar weather conditions, the third highest catch of cotton bollworm butterflies was recorded. The smallest butterfly populations were recorded in 1997-1999, during which the summer temperatures were lower and the amount of precipitation above-average.

If the predictions of global warming (which is often accompanied by droughts) in the 21st century come true, frequent mass occurrences of the cotton bollworm and other xerothermophilous pests (grasshoppers, thrips, Sunn pests, weevils, flea beetles, etc.) may be expected as well as some new species as a result of the expanding geographic distribution of some Mediterranean species.