

BIOLOGICAL CRITERIA FOR ACCEPTING OF BEE BREAD AS A MITE FOOD BY *Tyrolichus casei* Oudemans (*Acarina: Acaridae*)

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S u m m a r y

The object of the study was to confirm the possibility of the development of *Tyrolichus casei* Oudemans on bee bread and the acceptance of this product by mites as evidence that these pests might threaten the provisions of honeybees.

Monocultures of the species were set up from specimens collected from hive debris and were kept in the laboratory at temperature ca. +20°C, RH - about 85%; bee bread was used as mite food. Biological experiments were conducted under the same conditions.

Some live parameters (average) of *T. casei* were as follows: embryonic development - 3.4 days, complete life history - 14.5 days, mortality of juvenile instars - 10.0%, frequency of females - 52.2%, longevity of adults - 101.8 days, oviposition period - 34.3 days, fecundity of females per lifespan - 426.3 eggs.

These results show a comparatively high biological potential for raising *T. casei* on bee bread and confirm a working hypothesis as concern the attractiveness and effectiveness of this kind of medium in rearing acarid mites. Evidence is presented that cheese mites are potential pests of stored hive products.

Keywords: *Acarina*, bee bread, biology, pests, *Tyrolichus casei*.

INTRODUCTION

Tyrolichus casei Oudemans is a cosmopolitan acarid species commonly known as a cheese mite and pest of various stored food products. Apart from cheese and other stored food it has been observed as a pest infesting grain, damp flour, dog-food, sometimes on ergot of rye and in insect collections. There are also records of this species under the bark of old tree stumps and in a mouse nest (Boczek 1980, Hughes 1976, Olsen et al. 1982, Robertson 1946, Smiley 1991, Türk, Türk 1957, Zakhvatkin 1941). It belongs to a group of allergenic mite species causing human dermatitis (Henschel 1929, Rosicky et al. 1979)

In apiaries *T. casei* was observed as an

inhabitant of beehives colonizing hive debris, old honeycombs and as a pest infesting stored bee products and the provisions of bees, first of all bee bread and pollen (Chmielewski 1991 1992, 2001, Grobov 1981). As the results show from earlier studies on cheese mites fed bee- collected pollen (pollen pellets), they accept this product as a suitable nourishment for population increase (Chmielewski 1994).

The purpose of this study was the experimental confirmation of the possibility of cheese mite development on bee bread and the acceptance of this product as evidence that these pests might threaten the provisions of honey bees.

MATERIAL AND METHODS

Monocultures of the species were set up from live specimens collected from hive debris which were put into rearing cages and kept in the laboratory at temperature ca. +20°C, RH - about 85%; bee bread taken from honeycombs was used as mite food. Biological experiments were conducted under the same conditions.

Observations of mite development began on 100 newly deposited eggs (10 rearing cages x 10 one-day-old eggs) and finished after the eclosion of adults. Advances in the development cycle and mortality of specimens were recorded every 1-2 days.

Longevity and fecundity of mites were examined during observations of 25 pairs formed of freshly emerged adults (one pair = 1 female + 1 male), which were placed into rearing cages supplied with small pieces of bee bread (each pair was put into separate cage). Observations were made every 2-3 days until the natural death of all

specimens.

More particulars and descriptions of procedures used in similar studies on some acaroid mite species fed bee bread and bee-collected pollen, were published in earlier papers (Chmielewski 1978, 1983, 1994, 1995, 1998, 2000, 2002).

RESULTS AND DISCUSSION

Life parameters of *T. casei* obtained in the present studies conducted on bee bread, showed that this kind of nourishment was acceptable by these mites.

Comparison of these results with the bionomics of cheese mite obtained on bee-collected pollen, i.e. pollen loads, under the same temperature and humidity (Chmielewski 1994) proved that both of these media are very effective and bring about a favourable population increase. However some biological data were differentiated.

Table 1

Comparison of live parameters of *Tyrollichus casei* Oudemans reared on bee bread taken from honey-combs (present results) with biological data obtained on bee-collected pollen (Chmielewski 1994), under the same laboratory conditions: temperature - ca. +20°C, RH - ca. 85%; n - 100 specimens (development, mortality), n - 25 pairs (1 pair - 1 ♀ + 1 ♂) (longevity, fecundity)

Character	Bee bread (present results)	Pollen loads (Chmielewski 1994)
Embryonic development (days)	3.4(3-7)	5.7(3-10)
Complete life history (days)	14.5(9-19)	18.5(14-22)
Mortality of juvenile stages (%)	10.0(0-30)	49.3(10-90)
Frequency of females (%)	52.2(40-62)	47.2(30-90)
Longevity of adults (days)	101.8(28-216)	85.6(30-205)
Oviposition period (days)	34.3(19-53)	63.9(16-129)
Nonfecundity general (days)	39.6(4-137)	19.2(3-123)
Fecundity of females per life-span (eggs)	426.3(236-570)	443.9(93-820)
Productivity of female per oviposition day (eggs)	12.4(1-35)	7.4(1-25)

Such parameters as embryonic development (3.4 days) and complete development cycle (14.5 days) of mites obtained on bee bread were shorter than on pollen (5.7 and 18.5 days, respectively). The oviposition period on bee bread (34.3 days) was also significantly shorter than on pollen (63.9 days), but productivity of females fed bee bread (average 426.3 eggs) was slightly lower than on pollen pellets (443.9 eggs per life-span). Viability of *T. casei* fed bee bread expressed as a percentage of specimens finishing their development cycle as imagines (90.0%) and their longevity (101.8 days) was significantly higher than viability of mites reared on pollen (eclosion of adults - 50.7% and their average longevity - 85.6 days) (Table 1).

A comparison of the bionomics of *T. casei* fed on bee bread with biological data of other mite species (*Acarus farris* (Oudemans), *Acarus immobilis* Griffiths, *Acarus siro* L., *Glycyphagus domesticus* (De Geer)) obtained earlier, on the same kind of food, and under similar conditions, shows that biological parameters of cheese mite are evidently greater than the same parameters of other examined acaroids (Chmielewski 1983, 2002).

CONCLUSIONS

The results of these experiments show a comparatively high biological potential for raising *T. casei* on bee bread and for its population increase on this medium.

Calculated biological parameters confirm a working hypothesis concerning the attractiveness of this kind of food for this species.

It also provides evidence that cheese mite is a potential pest of some stored hive products (bee bread, bee-collected pollen).

Bee bread might be recommended as an useful, effective medium for rearing acarid mites under laboratory conditions for experimental and educational purposes.

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BIOLOGICZNE KRYTERIA AKCEPTACJI PIERZGI PSZCZELEJ JAKO POKARMU ROZTOCZY PRZEZ *Tyrolichus casei* Oudemans (*Acarina: Acaridae*)

Ch m i e l e w s k i W .

S t r e s z c z e n i e

Rozkruszek serowiec, *Tyrolichus casei* Oudemans, powszechnie znany jako szkodnik wielu przechowywanych produktów spożywczych, jest także mieszkańcem uli pszczelich, gdzie zwykle kolonizuje osyp gromadzący się na dennicach i poraża zapasy pokarmu swych gospodarzy zgromadzone w plastrach (pierzge, pyłek, miód); pojawia się też niekiedy w pracowniach pszczelarskich i magazynach pasiecznych na składowanych w nich produktach.

Czyste gatunkowo hodowle rozkruszka założono na bazie osobników dorosłych wybranych z osypu zimujących pszczół i prowadzono w laboratorium - w temperaturze $\pm 20^{\circ}\text{C}$, w wilgotności względnej powietrza ok. 85%, w klateczkach hodowlanych używanych przez akarologów w tego typu badaniach biologicznych; jako pokarm podawano roztoczom pierzge pszczelą.

Doświadczenia biologiczne prowadzono w tych samych warunkach. Obserwacje rozwoju roztoczy rozpoczynano na 100 świeżo złożonych jajach (10 jedno-dniowych jaj x 10 komórek hodowlanych) i kończono po wylęgu osobników dorosłych. Zaawansowanie cyklu rozwojowego sprawdzano co 1-2 dni. Długowieczność i płodność roztoczy były badane w toku obserwacji 25 par utworzonych ze świeżo wylęgniętych imagines (jedna para = 1 samica + 1 samiec), które umieszczano w klateczkach hodowlanych zaopatrzonych w małe kawałki pierzgi pszczelej (każdą parę trzymano w oddzielnej komórce hodowlanej). Kontrolę doświadczeń,

a także w miarę potrzeby uzupełnianie lub wymianę pokarmu, prowadzono co 2-3 dni aż do naturalnej śmierci wszystkich osobników.

Uzyskane parametry życiowe *T. casei* (średnie dane) przedstawiają się następująco:

Rozwój embrionalny (dni) - 3.4 (3-7)

Całkowity rozwój osobniczy (dni) - 14.5 (9-19)

Śmiertelność osobników w stadiach młodocianych (%) - 10.0 (0-30)

Frekwencja samic (%) - 52.2 (40-62)

Długość życia osobników dorosłych (dni) - 101.8 (28-216)

Okres składania jaj (dni) - 34.3 (19-53)

Bezplodność ogółem (dni) - 39.6 (4-137)

Plodność samic w ciągu całego życia (jaja) - 426.3 (236-570)

Produktywność samic na dzień płodny (jaja) - 12.4 (1-35)

Wyniki te wskazują na stosunkowo wysoki potencjał biologiczny *T. casei* na pierdze pszczelej i potwierdzają założenia hipotezy roboczej odnośnie do atrakcyjności i skuteczności tego rodzaju pożywki w hodowli rozkruszków. Są one także jednym z dowodów na to, że rozkruszek serowiec należy do potencjalnych szkodników przechowywanych produktów pasiecznych stanowiąc dla nich realne zagrożenie, w tym zwłaszcza dla pierzgi.

Słowa kluczowe: *Acarina*, biologia, pierzga, szkodniki, *Tyrolichus casei*.