ECONOMIC EFFICIENCY OF VARIOUS QUEEN BEES MAINTENANCE SYSTEMS

EFICIENTA ECONOMICA A DIFERITELOR SISTEME DE INTRETINERE A MATCILOR

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REZUMAT

Sistemele moderne de intretinerea matcilor se bazeaza pe utilizarea insamintarii artificiale, intretinerea matcilor in asa numita "banca de matci", in acest fel asigurindu-se o eficienta economica crescuta in apicultura. Acest studiu a avut ca scop compararea eficienței economice a implementării însămânțării artificiale în diferite sisteme de întreținere a mătcilor la Apis melifica. S-au luat în considerare trei variante experimentale: V1- matcă în cuşcă cu albina ei; V2-bănci de mătci; V3-mătci în nucleu. Pentru fiecare dintre cele trei variante de întreținere a mătcilor s-au evaluat cei mai importanți indicatori economici şi anume: cheltuielile, veniturile, profitul, numarul de mătci însămânțate şi selecționate, producția de miere, costul/matcă, venitul/matcă, profitul/matcă, rata profitului. Întreținerea mătcilor în sistemul "queen bank" este cea mai rentabilă asigurând 2400 mătci şi 20 kg miere comercializate/an, venituri de 12.442 USD, costuri totale de 3.400 USD, un profit de 0.042 USD, ceea ce înseamnă 3,77 USD/matcă şi o rată a profitului de 265,72 % în condițiile unor cheltuieli aferente însămânțărilor artificiale pe cale instrumentală de 1.058 USD, reprezentând 31,10 % din cheltuielile totale cu întreținerea mătcilor.

Cuvinte cheie: intretinerea matcilor, banca de matci, insamintare instrumentala, eficienta economica

ABSTRACT

The modern queens maintenance systems are based on the use of artificial insemination, queens' maintenance in the so called „queens bank" , in this way assuring an increased economic efficiency in beekeeping. This study aimed to compare the economic efficiency of the implementation of A.I. to various queen bees maintenance systems. Three alternatives have been taken into account: V1-a queen bee in a cage together with her bees, V2- a queen bank system and V3 – a queen bee in a nucleus. For each queen bee maintenance alternative have been evaluated the most important indicators such as: expenses, incomes, profit, number of marketable inseminated and selected queen bees, honey production, cost/queen, revenue/queen, profit/queen, profit rate. The most effective alternative was the queen bank system assuring 2,400 marketable queen bees and 20 kg honey delivered yearly, USD 12,442 incomes, USD 3,400 expenses, USD 9,042 profit, that is USD 3.77/queen bee and 265.72 % profit rate under the condition as A.I. costs are just USD 1,058, representing 31.1 % of total queen bees maintenance costs.

Key words: queen bees maintenance, queens bank, instrumental insemination, economic efficiency

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DETAILED ABSTRACT

Bee reproduction is a complex process requiring being permanently under the bee keeper's control. Instrumental insemination is a modern technique, which could be successfully handled by any beekeeper who would like to increase the number of bee families, honey and other bee productions, incomes and profit. Although it requires some investments, taking into account its advantages, queen bees ' instrumental insemination is more and more used. The modern queens maintenance systems are based on the use of artificial insemination and queens' maintenance in the so called „queens bank", in this way assuring an increased economic efficiency in beekeeping. This study aimed to compare the economic efficiency of the implementation of A.I. to various queen bees maintenance systems. Three alternatives have been taken into account: V1-a queen bee in a cage together with her bees, V2- a queen bank system and V3 – a queen bee in a nucleus. For each queen bee maintenance alternative have been evaluated the most important indicators such as: expenses, incomes, profit, number of marketable inseminated and selected queen bees, honey production, cost/queen, revenue/queen, profit/queen, profit rate. The most effective alternative was V2 - the queen bank system assuring 2,400 marketable queen bees and 20 kg honey delivered yearly, USD 12,442 incomes, USD 3,400 expenses, USD 9,042 profit, that is USD 3.77/queen bee and 265.72 % profit rate under the condition as A.I. costs are just USD 1,058, representing 31.1 % of total queen bees maintenance costs. But we have also drawn the conclusion that both V1 and V3 are profitable alternatives . The range of the considered alternatives from the point of profitableness is : V2, V1 and V3. Therefore, instrumental insemination is an effective tool in the bee keeper's hand to transform his apiary into a high profitable farm.

INTRODUCTION

In the modern bee keeping, reproduction is a complex biological process which must be kept under a permanent control by bee-keeper. The queen bee mating at the age of 5-7 days of adult life outside and at 1-3 km distance of the beehive, being restrained just by the non auspicious climate such as: wind, rainfall, air temperature below 20^{o}C. Also, natural mating does not allow to keep under control consanguinisation and genetic variability as well as genetic gain at Apis melifica species (5).

To optimise bees reproduction it is necessary to use modern A.I. techniques for assuring a permanent control upon the whole reproductive process. The transition natural to instrumental insemination requires special investments related to queen bees maintenance. Various researchers dealing with bees reproduction have emphasized the advantages of A.I. techniques, so that in the countries where bee-keeping is well developed and the demand of selected and tested queen bees is very high, queen bees A.I. is used on a large scale. That is why the researchers have been working to extend A.I. techniques in various queen bees maintenance systems such as: queen banks, queen maintenance in a nucleus and a queen in a cage together with the related bees (1,2,3,4,6). Taking into account these aspects, this study aims to estimate the economic effects of A.I. implementation in various queen bees maintenance systems to identify which of them is the most effective one.

MATERIAL AND METHOD

Three experimental alternatives have been studied as follows: V1-an isolated queen bee maintained together with her bees, V2-20-40 queen bees in a bank system together with their bees, V3- a queen bee in a nucleus, corresponding to natural bee-keeping. The following economic parameters have been evaluated for each alternative: total maintenance costs, cost items, incomes, profit, costs/queen bee, income/queen bee, A.I. cost/queen, profit rate.

RESULTS AND DISCUSSION

The costs of producing instrumental inseminated queen bees for each experiment and cost item are presented in table 1. The data show that the most expensive alternative is V3-queen bees in a nucleus (USD 4,123) while the cheapest system is V1-isolated queen in a cage together with her bees (USD 3,008).The share of various cost items is the following: queen bees costs until insemination 50.93 % for V1, 55.90 % for V2 and 63.40 % for V3; drones maintenance costs: 12.45 % for V1, 11.01 % for V2, 9.08 % for V3; insemination costs: 35.14 % for V1, 31.08 % for V2 and 25.64 % for V3; the difference belongs to the costs related to queen bees maintenance after insemination.

The incomes obtained from marketed inseminated queen bees are shown in table 2, of which one can see that in case of V1 and V2, we could produce 2,400 inseminated queen bees annually while in case of V3 just 1,600 queens. Taking into account that V2 and V3 also allow queen bees testing, queen price is estimated at USD 4.71/head by 75 % higher than in case of selling just inseminated queens. Therefore, the highest incomes are performed in a queen bank system, USD 11,308, by 63 % more than in case of queens maintained in a nucleus and by 75 % more than in the case of a queen isolated in a cage with her own bees. As honey produced in case of V1 and V3 is entirely used for covering feeding needs for the bees group, only the queen bank system can produce 20 kg marketable honey of which 8 kg Robinia honey, 2 kg Linden honey and 10 kg honey of mixed origin. The sale price for various types of honey: USD 0.86/kg Robinia honey, USD 0.77/kg Lime honey and USD 0.58/kg other honey can assure USD 1,135 incomes. Therefore, V2- bee keeping in a queen bank system could lead to USD 12,442 incomes by 92 % higher than in case of V1-queen maintenance isolated in a cage together her bees and by 80 % higher than in case of V3 – a queen maintained in a nucleus.

The financial results are shown per each experiment in table 3, reflecting that all the alternatives are profitable, but V2 is the highest effective one assuring USD 7,915.39 profit.

Table 1. Expenses related to the Producing of instrumentally inseminated Queen Bees (USD) / Cheltuieli legate de producerea de matci instrumental insamintate

Cost item / Elemente de cheltuieli	V1	V2	V3
A. Maintenance costs until queen A.I. / Cheltuieli de intretinere pina la insamintarea artificiala a matcii	1,543.15	1,902.69	2,615.30
Selected unmated queen bees / Matci selectionate neimperecheate	1,395	1,385	923.00
Cages for queen bees/.Custi pentru matci	34.62	34.62	-
Bees and honey combs/Faguri de albine si miere	69.23	253.85	1,538.46
Bee hives / Stupi	-	115.38	76.92
Frames / Rame	-	46.15	-
Food for bees / Hrana pentru albine	44.30	67.69	76.92
B. Drones maintenance costs / Cheltuieli cu intretinerea trintorilor	374.76	374.76	374.76
Bees / Albine	315.38	315.38	315.38
Replacing frames / Inlocuirea fagurilor	3.08	3.08	3.08
Bee hives / Stupi	46.15	46.15	46.15
Additional feeding / Hranire suplimentara	10.15	10.15	10.15
C. Queen A.I. costs / Cheltuieli cu insamintarea artificiala a matcilor	1,057.69	1,057.69	1,057.69
Insemination device / Instrumentarul pentru insamintare	423.08	423.08	423.08
Binocular magnifying glass / Lentila binoculara	592.30	592.30	592.30
CO_2 cylinder / Cilindru pentru bioxid de carbon	38.46	38.46	38.46
Cage for drones fly / Cusca pentru zborul trintorilor	3,85	3,85	3,85
D. Queens maintenance costs after A.I. Cheltuieli de intretinere a matcilor dupa insamintare	44.30	67.69	76.92
Queens and bees feeding costs / Cheltuieli cu hranirea matcilor si a albinelor	44.30	67.69	76.92
E. TOTAL COSTS / Cheltuieli totale	3,019.9	3,402.83	4,124.67

Table 2. Incomes from Producing and Selling instrumental inseminated and tested Queen Bees / Venituri din producerea si comercializarea de matci testate insamintate artificial

Incomes source / Sursa de venit	M.U.	V1	V2	V3
Inseminated queens sales / Cifra de afaceri din vinzarea matcilor	USD	6,456	11,304	7,536
Number of marketable queens / Numarul de matci vindute	Pieces	2,400	2,400	1,600
Average sale price / Pretul mediu de vinzare	USD/piece	2.69	4.71	4.71
Honey sales / Valoarea mierii vindute	USD	-	14.22	-
Honey production of which: / Productia de miere,d.c.	Kg	-	20	-
- Robinia honey (salcim)		-	8	-
- Linden honey (tei)		-	2	-
- Mixed honey (poliflora)		-	10	-
C. ***Honey price / Pretul mierii***		-		-
- Robinia honey (salcim)	USD/kg	-	0.86	-
- Linden honey (tei)		-	0.77	-
- Mixed honey (poliflora)		-	0.58	-
TOTAL INCOMES / Venituri totale	USD	6,456	11,318.22	7,536

Table 3. Financial Results / Rezultate financiare

	V1	V2	V3
Incomes / Venituri	6,456.00	11,318.22	7,536.00
Expenses / Cheltuieli	3,019.90	3,402.83	4,124.67
Profit	3,436.10	7,915.39	3,411.33

Table 4. Main indicators of Economic Efficiency / Principalii indicatori ai eficientei economice

	M.U.	V1	V2	V3
Inseminated queens/year Matci insamintate pe an	Pieces	2,400	2,400	2,400
Maintenance cost/inseminated queen / Costul intretinerii/matca insamintata	USD/ piece	1.25	1.42	2.58
Income/inseminated queen / Venitul/matca insamintata	USD/ Piece	2.69	5.18	4.33
Profit/inseminated queen / Profitul /matca insamintata	USD/ piece	1.44	3.77	1.75
Profit rate / Rata profitului	%	114.70	265.72	67.84

The main indicators of economic efficiency determined in this study are presented in table 4.
The V1 and V2 alternatives produce 2,400 inseminated queen bees per year while V3 obtains just 1,600 queens annually. The maintenance cost is USD 1.25 /queen bee in case of V1, in comparison with USD 1.42 in case of V2 and USD 2.58 in case of V3. The highest income/inseminated queen is achieved by V2, being by 92 % higher than the one carried out by V1 and by 19.82 % higher than the one obtained by V3. The profit level per inseminated queen bee in USD was 3.77 for V2, 1.75 for V3 and 1.44 for V1. Obviously, the V2 alternative assures the highest profit rate – 265.72 %, despite that we can also say that all the three alternatives are profitable.

CONCLUSION

-The queen bank system looks to be a real business for any beekeeper, as it assures producing and commercialisation of a higher number of artificial inseminated and tested queens at the highest profit rate.
-The investments in queen bank system can be recovered from incomes got in only one year, it does not matter what alternative of queen bees maintenance system the beekeepers would apply.
-The highest effective system is considered to be "queen bank system" as it assures 2,400 marketable queens and 20 kg honey, USD 12,442 incomes and USD 9,042 profit, meaning USD 3.77/queen bee.
-All the alternatives ensure a high profitableness in the apiary. From this point of view, the range of the studied alternatives is the following one: V2 – queen bees in a queen bank system, V1- an isolated queen bee maintained together with her bees and V3- a queen bee in a nucleus.
-As a general conclusion, the use of the new reproduction techniques based on instrumental insemination for queen bees is not only a valuable way for improving bee-breeding programmes but also a possibility to change the actual apiaries into modern commercial and durable bee-keeping farms.

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