

HONEY-PRODUCING POTENTIAL OF NUCLEI IN THE SEASON OF THEIR ESTABLISHMENT

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S u m m a r y

The objective of the study was to find an answer to the question whether newly-established nuclei can become productive colonies in the year in which they were established. In the years 1998-2002, strong 6-frame nuclei were established on the earliest date possible, they were fed twice with a stimulating dose of 1.5 l of sugar syrup and monitored for further development. The nuclei were assessed for development rate and productive potential. Upon completion of data analysis it was found that nuclei can produce a commercial honey crop in the season of their establishment provided that there is abundance of late-season nectar flows.

Keywords: bee colonies, nuclei, honey harvest, beekeeping technologies.

INTRODUCTION

Nuclei are established mainly to rebuild or to expand the apiary but they also provide one of the means to mitigate the swarming mood. It is one of many bee management practices frequently used in every apiary.

The objective of the study was to investigate the methods and the productive potential of newly established nuclei so that they might become production colonies in the year of their establishment.

Early-established nuclei are the most secure and the most efficient method to enlarge an apiary (Trzybiński 1992). A colony developed from a nucleus gains strength fast whilst the parent colony is not excessively weakened. Early nuclei established in May may produce a crop of honey already in the same season. Wilde (1996) found all newly-established colonies to have acquired substantial strength towards the end of the season which qualified them to overwinter on their own. The investigator points out that the establishment of nuclei provides a way to break the swarming mood in a period without nectar

flows that comes after the blooming of oil-seed rape. He recommends to establish nuclei with inseminated queens on 1-2 frames with sealed brood together with the bees that cover the frames. According to Marcinkowski (1982) the percentage of queen acceptance in nuclei is higher. According to Pidek (1984) the majority of beekeepers make as many nuclei as was the number of colonies that failed to survive the winter. A nucleus established at the beginning of June ought to be made up of at least three frames covered with bees. A nucleus made at the end of the month ought to have 5 Dadant frames (Pidek 1984, 1986). Newly made nuclei are best moved to a separate place so that the flying bees from the parent colonies cannot return to them. Once in a week the nuclei should be fed with 1 liter of 50% syrup. The researcher states that it is only in the following year that nuclei established in that manner will be able to use nectar flows for commercial honey production, the value of the wintered nuclei being equivalent to 10-13 kg of honey. Also Pidek (1991) maintains that the establishment of nuclei

in July involves a certain risk due to a poorer queen acceptance in the initial period or to queen loss later on. A comparison of research data showed that 4- and 5-frame nuclei had, on average, 52 and 102% more brood than did three-frame nuclei. Five-frame nuclei reared brood 1.5 times more efficiently than did nuclei with three frames (Pidek 1984). The investigator suggests that improvements in nucleus performance ought to be sought by changing the date of their establishment.

Marcinkowski et al. (1998) established nuclei with the old queen in the upper body of the same Wielkopolski-type hive, as one of the ways to break the swarming mood. After 3-4 weeks the two colonies were united and the more valuable queen was left.

METHODS

Nucleus establishment. The study was run in the years 1998-2002. In each of the apiaries of the Department of Beekeeping Technologies, Apiculture Division in Puławy, 10 nuclei were established on the earliest convenient date. They were 6-frame nuclei. First a queen was found in the parent colony. The queen was caged for the time of nucleus establishment. Three frames with sealed brood just about to emerge and with bees on them were taken to which two combs with stores of honey and bee bread, previously kept in a storehouse, and 1 frame with comb foundation were added. Additionally, from two combs covered with bees to maximum capacity, bees were shaken off to the nucleus. In the years 1998 and 2002 the queens from the parent colonies were introduced to the nuclei. In the remaining years young virgin queens were introduced. When an egg-laying queen was transferred from the parent colony she was accompanied by a young virgin queen. Newly-established nuclei were fed twice, in a week's interval, with 1.5 l of 1:1 sugar syrup.

Dates of nucleus establishment over the years of the study were as follows:

1998 – 21st May, 1999 – 16th June, 2000 – 12th May, 2001 – 5th June, 2002 – 28th May.

In the first and the second year of the study the newly-made nuclei were left in the apiary of origin. In the remaining study years they were moved to other apiaries, some 10 kilometers away, where late-season nectar flows, mostly linden, were to be expected. The aim was to create the possibilities for the nuclei to produce marketable amounts of honey. Another objective was to prevent the bees from returning from the nuclei to the parent colonies, and to preserve their strength thereby. Should linden flows have occurred the control colonies and parent colonies also had a chance to use them.

Experiment groups. The experiment colonies were settled in Dadant hives in the years 1998, 1999, 2000 i 2001 and in the Wielkopolski-type multi-storey hives in the last year of the study.

The experiment apiary was divided into three groups:

1. control colonies;
2. parent colonies;
3. nuclei.

Following the first spring inspection during which the condition of the colonies was assessed the colonies were divided into the control colony group and the parent colony group, each group comprising 10 colonies. Colonies of comparable strength were assigned to each of the groups. The colonies were stationed in an apiary located in an area of good spring honey flows (willow, oilseed rape, dandelion, false accacia).

In all study years control and parent colonies were evaluated for their strength (the number of frames covered with bees) during the first spring inspection. The evaluation of the same characteristic was

repeated on 18th June and 20th July and the newly-established nuclei were also included in the measurements of colony strength and development rate as related to the remaining groups. The measurements of brood area were not performed in this study because it would have been difficult to compare brood area in the nuclei with that in the remaining groups which ought to have already been measured during the first inspection. Moreover, some of the brood-containing frames were moved from the parent colonies to nuclei and thus the results would have been unreliable.

In addition, all the groups were examined for:

- honey yield over the season;
- number of rebuilt comb foundations;
- strength of ready-for-wintering colonies.

In order to make the results more uniform the data from the last study year in Wielkopolski-type hives were converted to make them compatible with those involving standard Dadant frames (the Wielkopolski frame area was assumed to be equal to 70% of the Dadant frame area).

The results were subjected to ANOVA and the significance of differences was examined using Duncan's test that was performed at the 0.05 level of significance. To that end the statistical program developed at the Laboratory of Experimental Methods and Statistics, Research Institute of

Pomology and Floriculture in Skierniewice was used.

RESULTS

The strength of the control colonies and of the parent colonies from which nuclei were going to be established was determined during the first inspection on different dates over the years of the study: in 1998 – 24th April, in 1999 – 27th April, in 2000 roku – 17 April, in 2001 – 5th April and in 2002 – 2nd April. Those dates reflect delayed spring in the years 1998 and 2000.

The controls and the parent colonies showed very similar strength (Table 1). The condition of the colonies was at its worst in the years 200 and 2001. In those years the colonies were the weakest during the first inspection. The colony strength was the highest in 1999. However, averaged across the study years the values were almost identical for both groups aforementioned and thus were indicative of high colony strength.

There was a distinct increase in the strength of controls and parent colonies over the period from the first inspection to 18th June (Table 2). On that date there still existed a substantial difference between those two groups and the new nuclei and those differences were highly significant even though the data from 2000 and 2002 pointed to a rapid development of the

Table 1

Average colony strength in the spring (number of frames covered with bees)

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	7.3 a	10.0 a	6.91 a	5.4 a	8.8 a	8.6 a
Parent colonies	7.2 a	9.7 a	7.36 a	5.5 a	8.8 a	8.7 a
Nuclei*	6.0	6.0	6.0	6.0	6.0	6.0

* The nuclei were included exclusively for presentation's sake as different dates of their establishment make the data from the first inspection unfit for comparison

Table 2

Average strength of colonies and nuclei on 18th June (number of frames covered with bees)

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	12.7 b	14.4 b	16.7 b	14.9 b	13.2b	14.4 b
Parent colonies	12.9 b	14.7 b	15.6 b	14.1 b	13.3 b	14.1 b
Nuclei	7.1 a	6.0 a	8.7 a	7.3 a	10.1 a	7.8 a

Table 3

Average strength of colonies and nuclei on 20th July

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	12.3 b	10.7 b	9.9 a	14.0 a	12.8 a	11.9 a
Parent colonies	12.7 b	10.1 b	10.6 a	14.6 a	13.3 a	12.3 a
Nuclei	8.6 a	6.0 a	10.8 a	13.8 a	13.1 a	10.4 a

Table 4

Average honey yield (kg)

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	15.8 b	12.5 b	20.62 b	13.4 a	9.83 b	14.4 b
Parent colonies	14.3 b	13.25 b	14.29 b	13.0 a	14.0 c	13.8 b
Nuclei	3.5 a	0.0 a	4.95 a	18.6 a	3.4 a	6.0 a

nuclei. When averaged across the years, the colony strength values for the nuclei were also significantly different from those for the remaining groups.

In the years 1999 and 2000 the strength of the two colony groups, parent colonies and controls, was observed to have declined over the period from 18th June and over the same period the strength of the nuclei remained practically at the same level (Table 3). The increase in the strength of the nuclei could be noticed in the year 1998 and it was particularly conspicuous in 2001 and 2002 when their

development rate was the highest. When averaged across the years, colony strength did not vary significantly among groups. Significant differences occurred solely in 1998 and 1999.

In the years 1998, 1999, 2000 i 2002 (Table 4) there were significant differences between honey yields from the nuclei and those from the remaining groups due to the absence of July nectar flows. In 2001, a year of copious July flows, the nuclei showed the tendency to give the highest yields. However, when the honey yields for the groups were averaged across the

Table 5

Average number of comb foundation sheets

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	4.0 b	3.5 b	3.9 a	5.4 b	2.9 b	3.9 b
Parent colonies	5.0 b	3.1 b	5.9 b	4.2 b	4.2 c	4.5 b
Nuclei	0.8 a	1.3 a	4.0 a	2.8 a	0.6 a	1.9 a

Table 6

Average strength of wintered colonies (number of combs covered with bees)

Group	Years					Group average
	1998	1999	2000	2001	2002	
Controls	8.1 b	7.4 a	7.0 a	5.9 a	4.71 a	6.6 a
Parent colonies	6.5 a	7.2 a	7.27 a	6.0 a	5.14 a	6.4 a
Nuclei	6.5 a	6.5 a	7.64 a	7.8 b	5.44 a	6.8 a

study years the difference between the nuclei and the remaining groups was found to be highly significant. In 2002, highly significant differences in honey yields were observed to occur among all the groups, the highest yields being obtained from the parent colonies.

With regard to comb foundation reconstruction (Table 5) the bees in the nuclei showed the best performance in the years 2000 and 2001, and the poorest in the years 1998 and 2002 when the newly established nuclei were given the queens from the parent colonies. Averaged across the years, the difference in the number of comb foundation sheets in the nuclei vs. that in the remaining colony groups was highly significant. In 2002, significant differences were recorded among all the groups. In 2000, the number of comb foundation sheets in the controls and in the nuclei was the same. Parent colonies tended to be the best rebuilders of comb foundation.

The strength of wintered colonies does

not show statistical differences with regard to group-to-group comparisons but there was a tendency for the nuclei to show higher strength (Table 6). In that connection, the nuclei could be regarded as honeybee colonies in their own right at that particular moment. Continued reference to them in the table as to "nuclei" is solely for comparison's sake. It is worthwhile to mention the occurrence of the significant difference in the strength of the nuclei vs. that of the remaining groups in favour of the former in 2001, the year when linden flows occurred.

DISCUSSION

By analysing the results obtained by Pidek (1986) according to which nuclei made in a given year are able to produce a commercial honey crop only in the following year endeavours were made to prove that, in the case of an abundant occurrence of late nectar flows, honey production is feasible in the same beekeeping season.

The same investigator states that nuclei established at the end of June should be made of at least three frames whilst Wilde (1966) recommends that once the oilseed rape flow is ended nuclei with 1 – 2 brood frames should be established and young virgin queens should be introduced to them. If one wants to have the nuclei developed into production colonies quickly one should establish them possibly in May and they should include at least 5-6 combs covered with bees. It is confirmed by Trzybiński (1992) who says that nuclei gain strength very quickly and the parent colony is not excessively weakened. Early nuclei made in May can produce a certain crop of honey already in the same year. According to the data from this study (Table 4), in 2001 honey yield by the nuclei was higher than that from the remaining groups, control and maternal, since they were strong enough to benefit from the copious linden flow, something that occurred only once in the course of the study.

It is of interest that the parent colonies, even though considerably weakened during nucleus establishment, were not permanently handicapped and maintained a rate of development during the season comparable to that of the control colonies (Tables 2 and 3).

The need to enlarge the apiary and to rise hop production warrants the establishment of strong early nuclei. In the years of the absence of late-season nectar flows the honey output of the nuclei and of mother colonies combined is higher than that of the colonies managed in the conventional way (Table 4).

The nuclei with old queens transferred from parent colonies were the worst comb foundation rebuilders. In other years controls and mother colonies rebuilt a much higher number of foundation sheets. It might be related to a smaller number of

foundation frames being added to the nuclei and to the use of ready combs instead so that the bees in the nuclei were not overexploited and regained strength faster. By introducing virgin queens in conformity with the suggestion that they are better accepted in the nuclei one should take into account a longer break in egg-laying and, consequently, a slower colony development (Marcinkowski, 1982). There are also cases of young virgin queens not being accepted in the nuclei which entails the necessity of their reintroduction. It makes the preparation of the colonies for an expected nectar flow much longer.

There is much conformity of the results from this study with those by Wilde (1996) regarding the acquisition of considerable strength by the nuclei towards the end of the season and the possibility of the nuclei to enter wintering as full-fledged honeybee colonies (Table 6). When favourable weather and nectar flow conditions prevail during the beekeeping season a situation like that can occur much earlier i.e. in the third decade of July (Table 3).

CONCLUSIONS

1. Establishment of nuclei is a good way to enlarge an apiary
2. The most favourable months to make nuclei are May and the beginning of June
3. Establishment of strong (6-frame) nuclei favours fast development and increase in strength
4. Given the occurrence of copious late-season nectar flows nuclei established in the spring can yield a commercial honey crop in the same season
5. Strong nuclei become full-fledged honeybee colonies by the end of the season

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**MOŻLIWOŚCI PRODUKCYJNE ODKŁADÓW
W SEZONIE ICH UTWORZENIA****Skubida P., Pohorecka K.****S t r e s z c z e n i e**

Celem prowadzonych badań było stwierdzenie, czy nowo utworzone odklady mogą stać się rodzinami produkcyjnymi w tym samym sezonie pasiecznym, w którym zostały utworzone. W latach 1998-2002 corocznie tworzone silne, 6-cio plastrowe odklady w możliwie najwcześniejszym terminie, dwukrotnie podkarmiano je stymulacyjnie dawką 1,5 litra syropu cukrowego i kontrolowano dalszy rozwój. Oceniano dynamikę ich rozwoju oraz możliwości produkcyjne. Po analizie uzyskanych wyników stwierdzono, że odklady mogą wyprodukować miód towarowy w tym samym sezonie pod warunkiem wystąpienia obfitych, późnych pożytków.

Słowa kluczowe: rodziny macierzyste, odklady, zbiory miodu, technologie pasieczne.