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Effects of Different Nutrition Levels of Persimmon Sap on Laying the Queen Bee Colonies of *Apis mellifera*

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ABSTRACT

Whatever a hive with high population inter a season of collecting nectar the rate of produce honey will increase as well. To provide energy needs in times of nectar shortage in nature, artificial nectar should be used to replace natural nectar, In order to assess the effects of different levels of nutrition, persimmon sap used as a stimulatory nutrition on laying queen bee rate in the colony in spring 2011, This experiment were conducted based on Completely Randomized Block Design (CRBD) with 5 treatments and 5 replications in wild land in Guilan province on (*Apis mellifera*). To reduce genetic disorders sister queen with the same age were used. Treatments 1, 2, 3, 4, and 5 were sugar and water syrup 1:1; persimmon sap and water, 3:1; persimmon sap and sugar, 1:2; persimmon sap and white sugar, 1:1 and persimmon sap and sugar, 2:1, respectively. Treatments were used for 60 days. Amount of laying by queen was measured by determined scale. Related data to influence of nutrition on laying of queen showed that there was a significant difference between control treatment and experimental treatment ($p<0.05$). The most amount of laying was belong to treatment 4 and the least amount was observed in treatment 2.

Key words: Persimmon sap, nutrition, laying the queen, honey bees

INTRODUCTION

Honey bees, like other organisms for their survival needs nutrition. The successful key to this is that beekeepers know scientific principles and apply techniques of professional beekeepers (Hashemi, 2005). Honey, a natural sweet substance produced by honeybees, has a wide range of applications in the food industry (Dibyakanta and Mishra, 2011). To diminish the impact of diseases in honey bees is of interest not just because of the well-being of the insects and the value of the honey that they produce for the beekeepers but for the value of pollination that many important crops are dependent on (Arbia and Babbay, 2011). The numerous pollen types and their diversity showed that bees travel considerable distance collecting nectar and pollen for honey production (Ebenezer and Olugbenga, 2010). Bee products included honey, wax, pollen, Propolis royal jelly and venom (Vanengelsdorp and Marina, 2010). Extra honey and water besides royal jelly must be added into the diets to promote the growth of larvae. We only know that in the whole developmental period queen bee larvae take royal jelly as their principal food (Bin *et al*., 2008). Stimulatory factors such as nutrition, young queen, the lack of adequate food and nectar in nature, laying queen in the healthy hive, growing population are immense important in honey production (Mclellan and Rowland, 2003; Neupane and Thapa, 2005; Calderone *et al*., 2002; Pourakbari and

Ghorbani, 2011; Taqi Pour Georgian Kalaee *et al.*, 2010; Kauffeld, 1980). Overuse of antibiotics in honey bee nutrition and out-break of Varva disease in the colony will decrease queen's laying (Matasin and Zeba, 2002; Calderone *et al.*, 2002). A study reported that adequate levels of thiamine vitamins (B1) and pantothenic acid (B5) cause to increase queen laying (Forghani *et al.*, 2007). A study entitle ,The effect of Chlorella algae nutrition on queen laying rate the results shown that the test diets have no significant effect on the spawning of the queen and the larvae rate (Babai, 2011). A study The used beet molasses instead of white sugar in bee nutrition. By Using of molasses colony's population in time to collect nectar, frame number of eggs, larvae, pupae and produced honey in the different treatments significantly reduced the mean (Modaresi, 2010) ($p<0.01$). A study compared three treatments with each other, sucrose (glucose standard), corn syrups containing high fructose (42 and 55%). Results showed no significant differences observed between treatments in terms of increase laying queen (Severson and Ericson, 1984). Artificial feeding of sugar syrup was necessary from May to August. Brood rearing activity in dearth period was increased with the increased amount of feeding (Bhuiyan *et al.*, 2002). A study carried out a pilot entitle the effect of niacin vitamin (B3) and pyridoxine (B6) on Queen laying rate. Results showed that the effect of niacin vitamin, pyridoxine on queen laying was meaningful (Sardari and Forghani, 2010) ($p<0.05$). The used different carbohydrates in the queen's ovipositional with consider cost of food; sugar was introduced as the best food for growing populations (Asadi Dizaji *et al.*, 2007). Usually artificial feeding of sugar syrup used a colony in spring with 1:1 and in autumn 1:2 (Edriss *et al.*, 2002). With respect to high cost of sugar in the honey bee nutrition, this study in addition to increase in queen laying, population increase as well and will reduce the costs of artificial feeding in colony. So persimmon sap syrup is recommended for this purpose. This is one of the northern forest trees with the scientific name (diospyros lotus). Sap of this fruit is rich in vitamin A and beta-carotene. It's containing sugar and glucose is loliz. It's also contains significant amounts of vitamins, B_1, B_2, B_3 and C.

MATERIALS AND METHODS

In order to assess the effects of different nutrition levels of sap forest persimmon as a feeding stimulant on laying queen bee rate in the colony, in spring 2011experiments conducted in Guilan province with different diets level base on a completely randomized design with five treatments and five replicates on the field on the honey bee (*Apis mellifera*). Treatments consisted of: treatment 1 (sugar syrup and water1:1ratio), treatment 2 (persimmon sap and water 1:3 ratio), treatment 3 (persimmon sap and sugar to a 2:1 ratio), treated 4: (persimmon sap and sugar 1:1), treated 5: (a ratio of 1:2 persimmon sap and sugar), for 60 days from the first week of April 2011 until the first week of June, 2011, were used as artificial nutrition. For reduce genetic disorders, used the Queen's sister with same age. In mid-March 2010, the tested colonies selection carried out according to the population, spawning and diet. Colonies were supplied with the experimental treatments 4 times a week at 17:00 p.m. The queen laying eggs measured through the level of their day with eggs, larvae and pupae and were taken by the scale of predetermined which can be expressed in terms of square centimeters (6×6 cm square grid). After nectars in nature were finished, honey harvested from each honeycomb. Statistical analysis was conducted using SAS 9.1 software. Duncan's multiple range test was used for mean comparison.

RESULTS

Data concerned to nutrition effect from the experimental treatments on laying queen bee in the colony showed that there are significant differences between control and experimental treatments

Table 1: Average laying the queen and produced honey (±SEM) in different treatments and compared them to the Duncan test at 5% probability level

Attribute treatment	Queen laying eggs base on No.	Produced honey
Sugar and water (1:1 ratio)	53784±6521^{c}	24.4±2.028^{c}
Sap persimmon and water (1:3 ratio)	21600±6521^{d}	16.0±2.028^{d}
Sap persimmon and sugar (2:1 ratio)	96552±6521^{b}	37.0±2.028^{b}
Sap persimmon and sugar (1:1 ratio)	125496±6521^{a}	47.4±2.028^{a}
Sap persimmon and sugar (1:2 ratio)	79488±6521^{b}	32.6±2.028^{b}

The mean that are in a column with similar letters are not significantly different ($p>0.05$)

Table 2: Comparing color of produced honey in different treatments through visual comparison

Treatment	Color
Sugar and water syrup (1:1 ratio)	Yellow
Persimmon sap and water (1:3 ratio)	Red
Persimmon sap and sugar (2:1 ratio)	Light brown
Persimmon sap and sugar (1:1 ratio)	Light brown
Persimmon sap and sugar (1:2 ratio)	Dark brown

($p<0.05$) (Table 1).The most laying queen belong to treatment 4 (mixture of persimmon sap and sugar, 1:1ratio) with 125,496 eggs and the lowest rate related to two treatments (persimmon sap and water with ratio of 1:3), with 21,600 eggs. The most amount of produced honey were belong to treatment D (47.4 kg) and the least amount was related to treatment B (16 kg) (Table 1). Color of the produced honey in different treatments was different (Table 2). honey were darker when density of persimmon sap is increased in treatments. With respect to the rate of the queen laying, the best performance was related to the concentration of 1:1 persimmon sap and sugar syrup.

DISCUSSION

Babai (2011) from Chlorella alga (Severson and Ericson, 1984), from 3 sucrose treatment (standard glucose), corn syrups containing high fructose (42 and 55%) and Modaresi (2010) used from sugar beet molasses in the diet of honey bees the results showed no significant effect on the laying queen, But if you use a sugar syrup along with sap persimmon, this index significantly improved. Sardari and Forghani (2010), Forghani *et al.* (2007) and Asadi Dizaji *et al.* (2007) reported that levels of the niacin vitamin (B3), pyridoxine (B6), thiamine (B1) and pantothenic acid (B5) and sugar enhance queen eggs laying and increase honey yield this results are consistent with their research. With respect that rich sap persimmon is from B vitamin, it seems that one of the positive effects on improving the laying rate of the queen and increase honey yield, is the presence of high levels of these vitamins in the sap persimmon. Regarding to the significant increase of honey production in all densities which persimmon sap is used and also by considering that the least amount of honey is obtained when pure persimmon sap is used, it is probably recommended that compound of persimmon sap and sugar has synergistic influence, therefore all compounds of persimmon sap and sugar had a better honey production than each of them. Color of the produced honey in different treatments was different. honey were darker when density of persimmon sap is increased in treatments. Therefore, using of sap persimmon with ratio of 1:1 in the spring stimulation nutrition of beekeeping is recommended to increase the performance.

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