Bee Varietals, Risks & Benefits

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Geog. 446 – Seeds Project Summary of Findings **Bee**

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Anatomy

Bees have six legs that vary in size and shape between species. The rear pair have rows of stiff hairs that are specially adapted to store pollen when bees are flying from flower to flower. On the front pair they have a slotted comb to clean their antenna (Heinrich, 2004). Bees have four wings which contain a small row of hooks to connect the front and hind pair. This serves to strengthen the bond between the wings so that they can operate as a cohesive pair (or one larger pair of wings) (Heinrich, 2004). When crawling around, the wings unhook and fold neatly behind each other. Bees have five eyes. Two compound eyes on either side of the head, and three simple eyes on the top of the head. The compound eyes are easily seen and contain multiple lenses (over 6000 on each eye) that are each pointed in a different direction. The images from the lenses combine together in the bee's brain to form a cohesive image which detects colour, pattern, light, and motion. The simple eyes contain one lens and is used to collect and focus light. This helps the bee orient itself to the sun even in cloudy weather so that it can navigate well during the day (Heinrich, 2004).

Differences between Honey Bees and Bumble Bees

Honey bees are the most advanced and socialized of all the bee types. They live in large well-organized colonies that can reach numbers as large as 50,000 bees. Each bee has a particular role in the colony, and they are particularly efficient at communicating and helping one another (Winston, 1991). Be careful not to step on a honey bee as the odor that is released will attract its buddies to defend (or avenge) their fallen comrade. Honey bees are the only type of bee that does not hibernate or die off during winter. Throughout the colder months the colony clusters together, using their bodies to generate heat. The cluster is about the size of a football, and the bees take turns being on the cold outside (Winston, 1991). Honey bee colonies produce a significantly larger amount of honey than any other bee type, which they store in a wax comb and use from one year to the next. One hive can produce about 60 pounds of honey a season (Winston, 1991).

Bumble bees have a smaller stature than honey bees and have a very hairy and round appearance. They live in nests with anywhere from 50 to 400 other bees, and only make small amounts of a honey-like substance to feed the hive (Heinrich, 2004). Bumble bees will often make their nests in a small enclosed cavity such as a bird house, mail box, or a hole in the ground. A queen honey bee can live for upwards of a year and will hibernate over winter in a hole in the ground. The rest of the hive will die off after only a

few months as they do not live through the winter (Winston, 1991). Unlike honey bees, bumble bees can sting more than once as they do not have an edge at the end of their stinger. However, they are not an aggressive breed and typically take no interest in humans - they would only sting if aggravated (Winston, 1991). Bumble bees prefer higher altitudes and are usually found in the northern hemisphere, particularly Canada and the USA. There are over 25 known species of bumble bee in British Columbia (Heinrich, 2004).

Nutrition and Health in Honey Bees

Nutrition is essential when it comes to honey bee workers. Healthy honey bee colonies have certain nutritional demands which vary between adult bees and their larva. Carbohydrates are the number one source of energy for honey bees. The essential carbohydrates are provided through nectars and honeydews, where it's collected and stored in the hive (Brodschneider & Crailsheim, 2010). Therefore, the adult workers will not survive long enough without feeding on these carbohydrates. Although an adult honey bee needs sugar everyday for survival, they are at risk as there are multiple sources of sugar that are toxic to bees (such as mannose, galactose, arabinose, xylose, melibiose, raffinose, stachyose, and lactose) that are mostly found in pollen (Brodschneider & Crailsheim, 2010). Furthermore, there are nutritional risks for the honey bees that could affect their wellbeing. One of the most common risks is starvation which can occur if the honey bee takes too long foraging and cannot return to the hive, or in feeding their larva damaging carbohydrates which can influence the behavioural development of the young bees (Brodschneider & Crailsheim, 2010). Another major cause of malnutrition comes from lack of diversification of pollen in their area. In agricultural areas, bees face a less diversified diet and the quality of the pollen could cause nutritional stress causing colony mortalities (Brodschneider & Crailsheim, 2010).

Agricultural Benefits

Honey bees are one of the most important commercial pollinators in our contemporary society. They play an important role in our ecosystem as they help pollinate crops that are dependent on animal pollination. This alone accounts for ‘35% of global food production’ (Genersch, 2010). Honey bees have become critical in providing food security, feasible agriculture and major economic benefits to humans. The honey bees pollination is also essential in providing greater biodiversity in the various ecosystems. Primary food production as well as human staple foods are ‘independent of animal pollination’, and humans are able to survive for extended-periods of time when eating staple foods independent of animal pollinators (Genersch, 2010). Nevertheless, it is estimated that humans would suffer in a number of ways after the extinction of honey bees. Living off staple foods is not nutritionally healthy, and animal pollinators help to produce a wider variety of fruits and vegetables. Genersch puts this analysis into perspective by stating that “crops which are independent of animal pollination account for approx. 65% of global food production, leaving as much as approx. 35% depending

on pollinating animals" (Genersch, 2010). Commercial pollination has become widespread in our society, and 90% of the commercial pollination is done by groups of controlled honey bees. Therefore, it is demonstrated that honey bees play a crucial role in providing humans with a nutritionally valuable diet, without them our diet would be impoverished.

Honey Bee Economics

With honey bees playing such a crucial role in our ecosystems, many researchers believe we are facing a "global pollinator crisis" (Genersch, 2010). Both North America and Europe have been experience a great decrease in the quantity of managed honey bees, and the fact that both continents are deeply dependent on honey bees makes this an important topic to address. The results are currently fluctuating as not all of the countries within these continents are facing a crisis. Genersch provides us with a couple of examples, indicating that within Europe, countries such as "Austria, Germany, Sweden and Switzerland are facing a critical decrease in the number of managed honey bee colonies, while countries like Greece, Italy, Portugal, and Spain report a considerable increase" (2010). Eastern Europe in particular has experienced a great decline in honey bee colonies during the 1990's. The primary causes of decline were the economic and political conflict going on in that region during the 90's. "In many countries of the Soviet bloc, honey had served as a second currency," therefore motivating citizens to maintain possession of their managed bees (Genersch, 2010). In other words, due to the change in economic system that occurred during that time period, the honey lost their economic value causing people to get rid of their bee hives. This led to a mass decline in honey bees in that particular region of Eastern Europe.

Disease

During the last 5 to 10 years, the number of diseases as well as environmental threats that negatively affect honey bees has increased immensely. It is clear that numerous diseases and pathogens have been involved in affecting colony mortality, lifespan, and colony health (Genersch, 2010). Many of these pathogens are human made from chemical insecticides which tend to be deadly for any insects they come into contact with. Furthermore, Genersch argues that "certain honey bee parasites have been shown to play a significant role in increased honey bee colony mortality" (Genersch, 2010). An example would include the varroa destructor (varroa mite) which is a parasite that leeches off honey bees, and weakens their immune system. This has serious effects not only on young but also adult bees. This specific disease will lead to the death of a colony approximately 2 years after infestation without any treatment (Genersch, 2010).

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