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Role of Bee colonies in Honey production for Sustainable Livelihood in Anantnag District of Kashmir Valley, J & K

Papel de las colonias de abejas en la producción de miel del distrito de Anantnag en el valle de Cachemira para los medios de vida sostenibles.

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ABSTRACT

Kashmir Valley has a tremendous potential for beekeeping due to the abundance of honey bee species, favourable climatic conditions and floral diversity. It contributes to the sustainable livelihood by increasing crop productivity through the process of pollination. The present study aims to examine Karl Pearson correlation between number of bee colonies and honey production since 2005-06 to 2017-18 in the district Anantnag of Kashmir valley. The secondary sources of data used for the investigation reveal that there is a strong positive correlation between bee colonies and honey production (0.834) in the study area. The number of bee colonies is seen as a dominating factor for honey production, thereby achieving sustainable livelihood and develop economy of the region. Beekeeping appears to be a critical component of sustainable agriculture and integrated rural development, as well as important for achieving food security and conservation of natural resources in the study area. Availability of diverse bee floral resources throughout the year helps in exporting quality honey to different parts of the world which promotes beekeeping in the study region.

Keywords: Bee colonies; Honey production; Karl Pearson correlation coefficient; Anantnag; Jammu and Kashmir; Sustainability

RESUMEN

La apicultura contribuye al sustento de la comunidad rural al aumentar la productividad de los cultivos a través del proceso de polinización y es importante para lograr la seguridad

alimentaria y la conservación de los recursos naturales y es el componente importante de la agricultura sostenible y el desarrollo rural integrado. El valle de Cachemira tiene un gran potencial para el desarrollo de la apicultura ya que tiene condiciones climáticas ideales. La diversidad de recursos florales de abejas disponibles durante todo el año ayuda a exportar miel a diferentes regiones, lo que promueve la apicultura en la región. El estudio tiene como objetivo examinar la correlación entre el número de colonias de abejas y la producción de miel desde 2005-06 hasta 2017-18 en el distrito de Anantnag. Las fuentes secundarias de datos se han utilizado para llevar a cabo esta evaluación y se ha observado que existe una correlación positiva perfecta entre las colonias de abejas y la producción de miel en el distrito de Anantnag del valle de Cachemira, que no solo es importante desde el punto de vista de los medios de vida sostenibles, sino que también contribuye a la el PIB de la economía J y K.

Palabras clave: colonias de abejas, producción de miel, Anantnag, Cachemira, correlación

INTRODUCTION

In Himalayan region of Kashmir valley, beekeeping plays an important role for sustainable livelihood which includes rearing, management and maintenance of honey bee colonies. Hive products like honey, beeswax, royal jelly and pollen provide both nutritious food and medicinal uses and income generation which contributes to rural development. Rich flora in the Kashmir valley guarantees more nectar collection is available through existing orchards, field crops and wild flora. In Kashmir valley the number of bee colonies was 15,405 during the 8th five year plan, which increased to 21,000 during the 9th five year plan and as a result honey production increased from 185 metric tons to 242 metric tons. Jammu and Kashmir has the potential to sustain more than 6 lakh bee colonies to produce 9000 tons of honey and provide livelihood opportunities for 12000 families, but despite this great potential, the desired level has not been achieved. (Jammu and Kashmir Annual planning report, 2008-2009). In Kashmir valley there are over 35000 honey bee colonies and potential for 120,000 colonies because of huge availability of horticultural land and rich floral diversity with varied climatic conditions and 1622 honey-producing units in Jammu and Kashmir with honey production capacity of 2000 metric tons (Honey processing in Kashmir valley/Greater Kashmir 2017). Beekeeping is a lucrative industry which has tremendous potential in union territory of J&K due to abundance of floral diversity (Honey industry/Kashmir vision, 2021). Jammu and Kashmir produces organic honey which is planning to establish seven lakh bee colonies in the valley which ensures sustainable development of the region.

Jammu and Kashmir is most suitable for beekeeping which helps beekeepers to enhance their honey productivity by maintaining colony strength, enable them to have more honey harvests annually (Abrol, 2002). By 2032 Indian Government aims to increase income of farmers and identify honey as a product that will help to create employment opportunities and sustainable livelihood to rural population. China occupies a lion share of world market of apicultural product for long time (FAO 2019).In Romania the impact of the number of bee colonies on honey production was found. (Grigoras 2018).In Nepal a significant positive correlation was found between the number of bee colonies and production of honey (Bhusal and thapa, 2011). Honey production by colonies depend on the race of the bees species, quantity of the bee colonies, type and bee flora plants (Gregner 2003).

Around the world, beekeeping provides nutritional, economic and ecological balance. It improves agriculture production and rural development. In beekeeping the number of bee colonies and honey production also increased (FAO 2015). Productivity of beekeeping is estimated as a measure of honey yield per colony/beehive which is a major factor affecting the profitability of beekeeping enterprises (Jones 2004; Ayansola 2012). Honey production is positively correlated with colony size and colony strength did not have a significant influence on honey production, though strong colonies plays an important role for honey production. (Gabuka 2014). Honey is a product of medicinal value (Subrahmanyam et al., 2001; Khan et al 2007). Honey per capita consumption of world is 200 grams and Germany is 1800 grams and India is only 8 grams (Pradip 2005; Agrawal 2014). Beekeeping offers great potential for sustainable livelihood opportunities which improves house hold income and poverty Alleviation in Nigeria (Ajao and Oladimeji 2012). Therefore conducting a research study on this theme is not only important from the prism of sustainable livelihood but also contributes to the GDP of J and K economy. The main objective of the study was to find out the beekeeping status in Anantnag district of Kashmir Valley by exploring the data on the number of bee colonies and honey production for time period, 2005-2018.

MATERIAL AND METHODS

Study area: The district Anantnag is located between geographic coordinates 33° 73' N 75° 8' E in the union territory of Jammu and Kashmir which lies in southern part of Jhelum Valley floor. Anantnag is known for perennial springs, rich in landscape of lush green meadows where abundance of floral resources are found. This forms the basis for successful beekeeping and plays an important role in sustaining plant biodiversity and produces organic honey in the

study area (Honey Production in Anantnag/Greater Kashmir, 2020). The total population of Anantnag district is 10.79 lakh and literacy rate of the district is 64.32 percent. (Census of India, 2011). Anantnag district is famous for Health resorts which includes Verinag, Kokernag, Achabal, and Pahalgam. Agriculture plays a prominent role for J&K economy which includes apiculture, sericulture and other allied activities where 70 percent of the population depend on agriculture for livelihood. The mean maximum temperature and minimum temperature is 19.8℃ and 7. 5℃ of Kashmir valley. The location map of study area is depicted in figure 1.

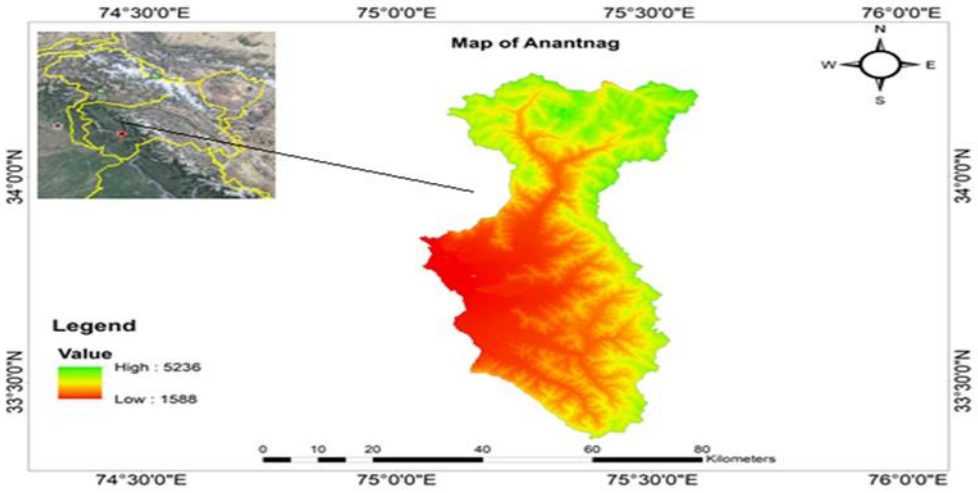


Figure 1: Location map of study area (Source: Shutter Radar Topography Mission SRTM-30m) USGS Earth Explorer.

The present work has been carried out on the time series data from 2005-06 to 2017-18 which were collected from secondary resources which includes FAOStat and published records of Digest of statistics, Directorate of Economics and statistics, Government of Jammu and Kashmir Agriculture Department (2019). We perform correlation analysis for examine the relation between number of bee colonies and honey production. The correlation coefficient with usual notations is given by

$$r_{xy} = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}}, \text{ Where } S_{xy} = \sum xy - n\bar{x}\bar{y}, S_{xx} = \sum x^2 - n\bar{x}^2, S_{yy} = \sum y^2 - n\bar{y}^2 .$$

The significance of correlation is tested by using student t-test and test statistic is defined

$t = \frac{r_{xy}\sqrt{n-2}}{\sqrt{1-r_{xy}^2}} \sim t_{(n-2)}$. which is Student's *t* distribution with n-2 degrees of freedom.

Results and Discussions

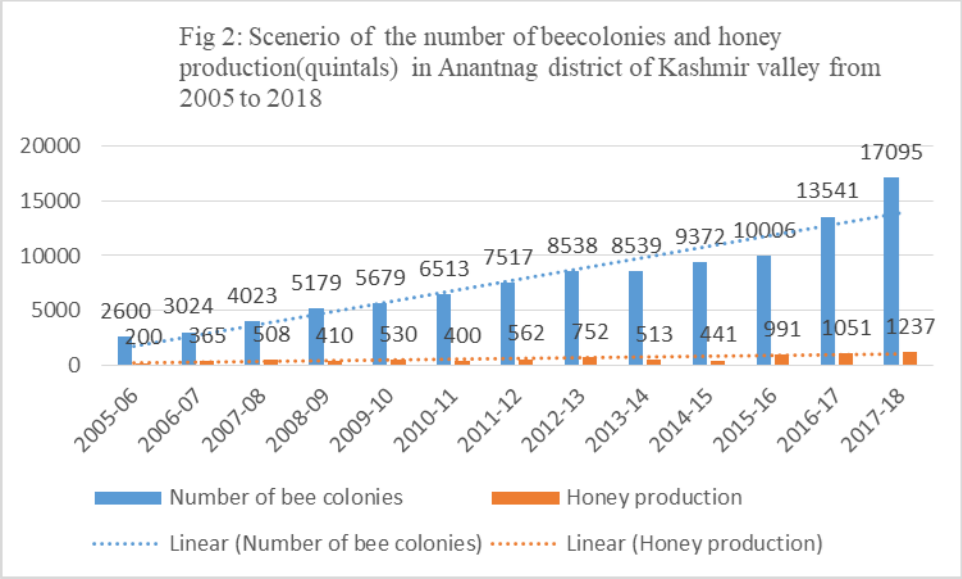
Karl Pearson Correlation is a statistic measure of the linear relationship between two variables in the study and produces a correlation coefficient r which measures strength and direction of linear relationship between variables. The variables used for study are number of bee colonies and honey production in Anantnag district of Kashmir valley since 2005-2006 to 2017-2018. From Table 1. It was observed that the correlation between the number of bee colonies and honey production was 0.834, implying that there is a positive correlation between the two variables. Further, p. value was observed to be 0.020 which is less than 0.05 implies that there is significant positive correlation between the number of bee colonies and honey production.

The variables move in the same direction where number of bee colonies is directly related to the Honey Production with strong positive correlation 0.834. In figure 2. It has been observed that number of bee colonies also increases from 2600 in 2005-006 to 17095 in 2017-18 in Anantnag district of Kashmir valley and production of honey also increases from 200 quintals in 2005-006 to 1237 quintals in 2017-18 which depicts that bee colonies, honey production has also increased in bee farming (Department of Agriculture J and K, 2019). The graphic representation shows the strong positive correlation between number of bee colonies and honey Production in figure. 3.

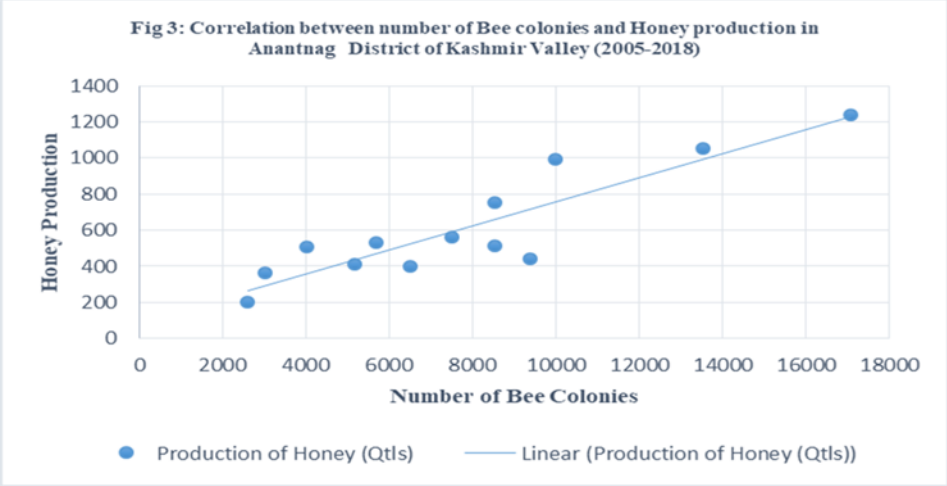
Table 1: Karl Pearson correlation coefficient between bee Colonies and honey Production in district Anantnag, Kashmir Valley.

	Pearson Correlation	Bee Colonies	Honey Production
Bee Colonies		1	0.834*
	Sig. (2-tailed)	0.020	
	N	13	13
Honey Production		0.834*	1
	Sig. (2-tailed)	0.020	
	N	13	13

*. Correlation is significant at the 0.05 level (2-tailed).



Source: Department of Agriculture, Govt of J & K (2019)



Discussions

The strong positive correlation was observed between the number of bee colonies and honey Production shown in table 1 in Anantnag district of Kashmir Valley due to strong bee colonies which is responsible for increasing honey production and productivity. Strong bee colonies is positively correlated with increasing honey production that contributes to sustainable development of the region in the study area which reveals that honey production is positively correlated with number of bee colonies. In Anantnag district of Kashmir, Vast diversity of flora is found including willow, Acacia, Plectranthus regosus (locally called solai) where bees collect nectar which is common source of their food to feed bee colonies and starts the process of making honey production. Acacia locally known as kiker tree is mostly found in western

Himalayan region of Kashmir valley that contributes to increasing Honey production. (Honey Production in Kashmir/Greater Kashmir, 2015). The Migratory Beekeeping system is an important component of Jammu and Kashmir bee farming which involves migration of bee colonies that plays a significant role in increasing Honey production (Sharma et al., 2017). Migratory Beekeeping not only economically viable to the beekeepers but also improves in agriculture production and productivity (Gupta et al., 2017; Sharma 2019).

Conclusion

The present study reveals that there is a strong positive correlation between number of bee colonies and honey production since 2005-2007 to 2017-18 in Anantnag district of Kashmir valley which measures strength of a linear relationship between two variables. In Kashmir valley beekeeping is an important resource base of mountain farming systems and contributes millennium development goals of agriculture sustainability. However, due to constraints such as lack of basic infrastructure, skilled manpower, training, extension facilities, indiscriminate use of pesticides and herbicides, inadequate preventive and control measures for tackling pests and diseases, are the main constraints in Kashmir valley. Government authorities need to seriously address the problems faced by beekeepers and help marginal farmers continue honey bee farming. This can be achieved through the effective supply chain management to fetch maximum returns from Apiculture, a step towards sustainable livelihood.

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