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Feeding Spectrum of Vespa Orientalis Linnaeus, 1771 Under the Conditions of Southern Fergana

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Annotation: This study investigates the feeding spectrum of Vespa orientalis in the Southern Fergana region, focusing on the dynamics of its utilization of prey resources occurring in both natural and anthropogenic landscapes. Field surveys were conducted between 2024 and 2025 across several ecologically and agroclimatically diverse localities, including Bagdod, Rishton, Fergana District, Fergana City, and Oltiarik. Monitoring revealed that the species consistently exploits protein-rich prey groups such as flies (Musca), ants (Formicidae), lepidopteran larvae (Lepidoptera), grasshoppers (Acrididae), honey bees (Apidae), as well as other small insects. In addition, V. orientalis exhibited a strong dependence on carbohydrate-rich plant resources, with grapes, apples, pears, figs, and watermelons-known to produce sugary exudates-serving as important trophic sources. The findings demonstrate the species' high ecological plasticity, seasonal flexibility in feeding strategies, rapid integration into natural and human-modified ecosystems, and its significant ecological role as a predator within

agroecosystems.

Keywords: Vespa orientalis, feeding spectrum, Southern Fergana, insect protein, fruits.

Introduction

The Southern Fergana region represents an ecologically complex area characterized by diverse climatic and landscape conditions, as well as a high degree of anthropogenic influence. Investigating the species composition of its entomofauna, together with their ecology, trophic relationships, and population dynamics, is not only of theoretical significance but also of practical importance for agriculture and environmental management. Among social wasp species, *Vespa orientalis* occupies a particularly prominent position due to its high ecological adaptability and trophic activity [7].

Vespa orientalis is distributed across many regions of the Palearctic, and in recent years it has been increasingly reported to penetrate and establish within anthropogenic landscapes [1, 6]. As a predator, this species exploits a wide range of prey groups, including flies, ants, lepidopteran larvae, honey bees, and other protein-rich insects that constitute its primary food resources. Proteins play a crucial role in supporting the rapid development of larvae within the colony [4].

In addition, *V. orientalis* is well known for actively exploiting carbohydrate-rich fruit sources such as grapes, apples, pears, figs, and watermelons, which exude sugary secretions. Such resources support its energy metabolism and flight activity, thereby enhancing the ability of worker wasps to search for prey over long distances [8]. The frequent presence of this species in fruit orchards further indicates its direct influence on agroecosystems. This study is aimed at investigating the feeding spectrum of *Vespa orientalis* under the environmental conditions of Southern Fergana.

Literature Review

The biology, ecology, and trophic characteristics of *Vespa orientalis* indicate that this species is a highly adaptable predator capable of persisting across a wide range of ecosystems [4, 7]. Previous studies have reported that colonies of predatory vespa species exhibit a strong dependence on protein resources during periods of peak colony development, with insect prey playing a particularly critical role in larval growth and maturation.

Research conducted by Archer (2012) demonstrated that *V. orientalis* is widely distributed across several regions of the Palearctic and exhibits a high degree of adaptability within anthropogenic landscapes. According to the author, this species continues to expand its geographic range in urbanized areas due to its ability to easily locate prey and its notable tolerance to high temperatures [1]. Rittner and Freidberg (2017) likewise emphasized that the rapid increase of *V. orientalis* populations in the Middle East and Eastern Mediterranean is closely linked to human activity, noting that the species frequently forages in waste disposal sites, markets, livestock farms, and residential zones [6].

In the context of feeding behavior, the literature identifies clear distinctions among various trophic groups. For example, Spradbery (1973) reported that *V. orientalis* is a major natural predator of flies, grasshoppers, numerous lepidopteran larvae, and honey bees [7]. Haddad and Adjlane (2019) further highlighted the potential threat posed by this species to apiculture, noting that colonies of *V. orientalis* increase rapidly in areas where honey bee prey is readily available [3].

The literature on carbohydrate-based food sources similarly provides complementary evidence. Observations conducted by Tan et al. (2021) within agroecosystems revealed that *V. orientalis* actively exploits ripe fruits, vineyards, market waste, and various plants that produce sugary

secretions. Their research emphasizes the importance of carbohydrates in meeting the energetic demands of worker wasps, particularly for sustained flight and long-distance foraging [8]. Likewise, van der Vecht (1957) noted that the consumption of sugary foods significantly enhances the long-term survival and seasonal persistence of *V. orientalis* colonies [9].

An analysis of regional differences indicates that although this species employs similar trophic strategies across various climatic zones, the availability of specific food resources depends heavily on local environmental conditions. For instance, predation on honey bees is particularly intense in Mediterranean countries, whereas in Central Asia both protein-rich prey and carbohydrate-rich fruits play substantial roles in the diet of *V. orientalis*. In the Southern Fergana region, the mosaic of anthropogenic landscapes (orchards and crop fields) and natural biotopes contributes to a broader and more diverse trophic spectrum for this species.

Materials and Methods

Field studies were conducted between 2024 and 2025 across several districts of Southern Fergana, including Bagdod, Rishton, Fergana District, Fergana City, and Oltiarik. Specimens were collected using entomological nets and Mericke-style water traps, which are widely used for monitoring flying insects [2, 5]. Additional equipment employed during the research included binoculars, a hand lens, a video camera, and 70% ethanol for specimen preservation. Behavioral observations were carried out to document the feeding activities of *Vespa orientalis*. During monitoring, captured wasps and their associated food remnants (prey items and fragments) were collected. The specimens were transported to the laboratory, where they were examined and analyzed using a microscope. Modern video recording equipment was used to document food items transported to the nest by worker wasps, followed by subsequent analysis of the footage. Furthermore, direct observations of fruit-feeding behavior were performed in orchards and agroecosystems to assess the species' utilization of carbohydrate-rich plant resources.

Results

The investigations carried out in the Southern Fergana region revealed that the feeding characteristics of *Vespa orientalis*, particularly its utilization dynamics of both animal- and plant-derived resources found within natural and anthropogenic landscapes, reflect a high degree of ecological adaptability. The collected data demonstrated that *V. orientalis* consistently feeds on insects belonging to various trophic groups throughout the active season and actively exploits sugary exudates from fruits.

The results on insect-based feeding revealed that *Vespa orientalis* actively utilizes prey insects during nearly all stages of the spring, summer, and autumn seasons. The main trophic groups identified among its prey included flies (*Musca*), ants (Formicidae), butterflies and their larvae (Lepidoptera), grasshoppers (Acrididae), honey bees (Apidae), dragonflies (Odonata), true bugs (Heteroptera), and aphids (Aphididae) (Table 1).

Table 1. Insect prey captured by *Vespa orientalis*

№	Insects	Scientific name	Nutritional significance	Feeding season
1	Flies	Musca	Protein-rich prey	Spring, Summer, Autumn
2	Ants	Formicidae		
3	Butterflies and their larvae	Lepidoptera		
4	Grasshoppers	Acrididae		
5	Honey bees	Apidae		
6	Dragonflies	Odonata		
7	True bugs	Heteroptera		
8	Aphids	Aphididae		

All of these prey groups are nutritionally rich and are distinguished by their high protein content. In particular, lepidopteran larvae and members of the Apidae possess high energetic value, which supports rapid larval growth within the colony. Analysis of these trophic objects showed that *V. orientalis* colonies feed especially intensively on insects during the summer months, a period that enables the colony to reach its peak population size.

The data obtained on the use of fruit resources indicate a strong dependence of *Vespa orientalis* on carbohydrate-rich food sources. During the study, it was found that fruits such as grapes (*Vitis vinifera*), apples (*Malus domestica*), pears (*Pyrus communis*), watermelons (*Citrullus lanatus*), and figs (*Ficus carica*) emit strong aromas and produce sugary exudates, making them highly attractive trophic resources for this species (Table 2). Fruit consumption was primarily observed during the summer and autumn seasons. This period coincides with the emergence of a new generation of males and females within the colony, which increases the demand for additional carbohydrate sources. Carbohydrates play a crucial role in energy metabolism, enabling sustained flight activity and supporting the thermoregulation and foraging efficiency of worker wasps.

Table 2. Fruits consumed by *Vespa orientalis*

№	Fruit	Scientific name	Nutritional significance	Feeding season
1	Grape	*Vitis vinifera*	Carbohydrate-rich food	Summer, Autumn
2	Apple	*Malus domestica*		
3	Pear	*Pyrus communis*		
4	Watermelon	*Citrullus lanatus*		
5	Fig	*Ficus carica*		

The results further confirmed the high ecological plasticity of *Vespa orientalis*. The species' ability to feed on insects belonging to various taxonomic groups contributes significantly to its success as a predator and indicates that it may exert substantial influence on biodiversity within agroecosystems. In particular, predation on honey bees can lead to sharp increases in local wasp populations in the vicinity of apiaries. Meanwhile, the species' consumption of fruit may cause partial damage to ripe fruit in horticultural plantations.

Discussion

The conducted research confirmed that *Vespa orientalis* exhibits a high level of ecological adaptability under the environmental conditions of Southern Fergana. The diversity of trophic objects recorded throughout the study indicates the species' strong predatory nature and demonstrates its ability to maintain a stable food base across different seasons of the year. In particular, the regular consumption of protein-rich insects-such as flies, ants, lepidopteran larvae, members of the Apidae, and grasshoppers-provides the foundation for rapid larval development and the seasonal strengthening of *V. orientalis* colonies. These findings fully corroborate previous studies, which emphasize the pivotal role of protein in larval development among large *Vespa* species.

In addition, active utilization of carbohydrate sources-such as grapes, figs, pears, apples, and watermelons, which produce sugary exudates-was observed in this species. These resources provide the physiological foundation for worker wasps' energy metabolism, defensive behavior, and ability to undertake long-distance flights. The increased consumption of fruits during the summer and autumn corresponds with the formation of the new reproductive generation in these seasons, thereby reducing the colony's vulnerability to minor trophic limitations.

The complex feeding spectrum of *Vespa orientalis* enables the species to thrive successfully both in natural ecosystems and in anthropogenic environments. In particular, its predation on honey bees suggests that this species may pose a threat to apicultural activity. Additionally, its

consumption of sugary exudates from ripe fruits in orchards has been evaluated as a factor capable of causing partial damage to horticultural crops.

Conclusion

In conclusion, it can be stated that the feeding spectrum of *Vespa orientalis* in the environmental conditions of Southern Fergana is exceptionally broad, and its active utilization of protein and carbohydrate sources from various taxonomic groups reflects a high degree of ecological adaptability. As demonstrated in the course of the study, insects such as flies, ants, lepidopteran larvae, grasshoppers, and honey bees constitute the primary protein sources for this species and play an important role in supporting rapid colony development. In addition, the use of sugary fruits-including grapes, apples, pears, figs, and watermelons-provides essential energy for worker wasps and enhances their seasonal activity.

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