

Genomics 2019: Studies on the taxonomy of honeybees in the Sudan

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An intensive morphometrical and some atomic hereditary investigations (Mitochondrial DNA) were completed on the most well-known bumble bees in the Sudan. These so far contribute in the ID of the Sudanese bumble bees. Nineteen examples of bumble bee laborers *Apis mellifera* L. were gathered from four diverse geological zones of the Sudan. Four examples of the little Asian honey bee laborers *Apis florea* got from Gerry, Khartoum, Madani and El-Dender were likewise remembered for the study. Biometric estimations and investigation were performed for all the examples. The 19 states were exposed to morphometric estimations in addition to another 8 distinct examples of *Apis mellifera* L. were additionally exposed to Mitochondrial DNA examination and investigation. Results were contrasted and those of the biometric study. The morphometric factual investigation of the nineteen examples uncovered a wide scope of contrasts in most discriminant characters among the examples. In the important part examination (PCA), three groups were graphically framed. Besides, the presence of these three groups was affirmed by some cutting edge discriminant examination techniques, and they were topographically connected. The bunch with the littlest estimations of some discriminant characters began from the backwoods zone. Its normal estimations were as per the following: forewing length 8.23 mm., width 2.82 mm.; proboscis length 5.55 mm.; rear leg length 6.83 mm.; body size (T3+ T4) 3.88 mm., and cubital list 1.85 mm. The second group with medium estimations of some discriminant characters, started from the semi-desert zone. Its mean normal estimations were as per the following: forewing length 8.27 mm., width 2.88 mm.; proboscis length 5.63 mm.; rear leg length 7.00 mm.; body size (T3+ T4) 3.88 mm.; and cubital record 2.04 mm. The third bunch, with the most noteworthy estimations of some discriminant characters, begun from the savannah zone; primarily towards the line with Ethiopia. Its normal estimations were as per the following: forewing length 8.45 mm., width 2.95 mm.; proboscis length 5.59 mm.; rear leg 7.05 mm.; body size (T3+ T4) 4.00 mm., and nearly the most elevated cubital record of 2.24 mm. Correlation between the 19 Sudanese bumble bees tests and 242 bank tests (information bank, Institute für Bienenkunde, Oberursel, Germany from an adjoining nations) was finished utilizing PCA. The three bunches of the Sudanese honey bees resembled astute recognizable as subclusters. Similar outcomes were likewise affirmed by the discriminant investigation. In this manner, the littlest honey bees of Sudan were recognized as *Apis mellifera* sudanesis rather than *Apis mellifera yemenitica* which address the honey bees of the woods zone. The medium measured honey bees were recognized as *Apis mellifera yemenitica* rather than *sudanesis*., addressing the semi-desert zone honey bees,

while the biggest honey bees held the name *Apis mellifera bandasii*., addressing the Savannah zone honey bees. The estimation of hereditary variety in the Sudanese bumble bees *Apis mellifera* L., at the mitochondrial DNA level of the 27 examples uncovered the present of sex various haplotypes. The bunch with the littlest estimations (woods zone states) had just haplotype A1 addressing 100% of the entire estimated settlements; the medium group (semi-desert zone provinces) forces two unique haplotypes O1 and Y2 with rates 75% and 25% separately from the entire estimated provinces of the zone, while the bunch of most elevated estimations (savannah zone) demonstrated four distinct haplotypes, O1, O1', A2 and A4, addressing 54%, 13%, 13% and 20% individually. These outcomes mostly affirmed the biometric estimations of the PCA and discriminant investigation. The current investigation address the primary record on the grouping of the Sudanese bumble bees as indicated by mitochondrial DNA fluctuation.

The current investigation recommend that, the presence of the quality stream among the Sudanese honey bees in the southern piece of the semi-desert zone and practically all the savannah zone of the Sudan is a consequence of heterogeneous blood blend between the Sudanese honey bees and the Ethiopian honey bees in the line between the two nations and the quality stream course may be from the swamp of the savannah zone of Ethiopia towards the western piece of the Sudan in the territory between scopes 9° N and 15° N. Likewise this investigation recommends that the beginning haplotype of the Sudanese honey bees is A1 and the unadulterated Sudanese honey bees may be the south Sudan race (*A. m. sudanesis*). The four *Apis florea* tests were likewise treated by PCA and discriminant examination, the outcomes got so far uncovered that, provinces are not extremely particular showing that, these settlements were comparative and initially they were descendent of the originally recorded state of *Apis florea* in Khartoum in 1985. Treatment of the four Sudanese *Florea* tests along with 6 *Florea* settlements of various beginnings [2 from Sudan "Moggas ones" and 4 from the information bank, Institute für Bienenkunde-Oberursel-Germany (Mogga 1988)], by bunch segment investigation (which analyze values across classes); uncovered that, the four objective *Florea* tests of Sudan may be brought from Pakistan or South Iran.

The old of bug's goes back to Upper Carboniferous period, which is around 350 million years prior. A few changes in creepy crawly fauna were seen in the Permian, Mesozoic, Triassic and Jurassic periods that followed. When blooming plants become set up in Cretaceous period, numerous bugs including specoid (ruthless wasps) and ants with social conduct

were found related with the plants (Winston, 1978). Honey bees separated from a wasp predecessor around 100 million years prior (Michener, 1974; Michener and Grimaldi, 1988), when the angiosperms were turning into the prevailing vegetation. The advancement of attributes, for example, plumose

hair, expanded rear legs for dust assortment, and mouth parts fit for ingesting nectar permitted a familial structure to relinquish ruthless way of life and make blossoming plants its essential food source (Raven and Axelrod, 1974). Because of dust gathering constructions and propensities, taxonomists place honey bees in their own super family, Apoidea (request: Hymenoptera), Culliney, (1983); Winston (1987), with 10 or 11

families (Michener, 1979. Michener and Greenberg, 1980), 700 genera (Malyshev, 1968), and 20.000 species (Michener, 1969) portrayed. The bumble bee is a since quite a while ago tongued honey bee, ordered in the family Apidae (Apinae: Apini) (assessed in Raven and Axelord, 1974) alongside the honey bees (Bombinae: Bombini), the Orchid honey bees (Bombinae: Euglossini) and the sting less honey bees (Meliponinae) (Winston and Michener, 1977. Kimsey, 1984), as in addendum (C). Current bumble bees have a place with a solitary sort, Apis, which contains in any event seven species: *A. andreniformis*, *A. cerana*, *A. dorsata*, *A. florea*, *A. koschevnikovi*, *A. labortiosa*, and *A. mellifera*, (Alexander 1990; Otis, 1990 and Michener, 1990), reference section (D).