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TO COMPARE THE DOMINANCE OF NATURAL ENEMY COMPLEX AGAINST MAIZE STEM BORER, CHILO PARTELLUS

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ABSTRACT

An investigation was carried out to compare the dominance of natural enemy complex (parasitoids and predators) against maize stem borer, Chilo partellus during 2015 and 2016 by determining their dominance coefficient. The dominance coefficient of natural enemy complex varied in both 2015 and 2016. In comparison with the natural enemy complex recorded in 2015, the year 2016 showed highest abundance of natural enemies. During both the years, Trichogramma spp. was at the uppermost peak followed by Cotesia flavipes and then by Coccinella septumpunctata. These species were common in all the selected regions of Indore, showing high to moderate effect on the mortality of eggs, larvae and pupa of Chilo partellus. Furthermore, Ants belonging to the family formicidae (Componotus spp and Pheidole sp.) were also common in all selected regions among the entire natural enemy complex.

Key words:- Coccinella septumpunctata, Cotesia flavipes, Dominance coefficient,Stem borers, Natural enemies complex.

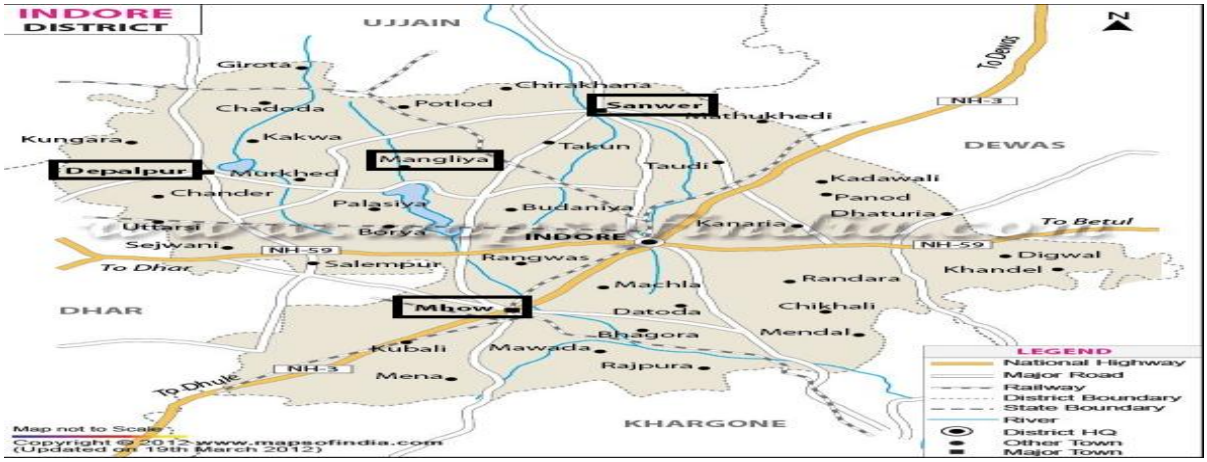
I.INTRODUCTION

Natural enemies complex play an important role in the control of lepidopterous borers. Biological control is the use of parasitoids, predators, nematodes and pathogens to maintain density of a species at a lower level than would occur in their absence. Natural enemy complex lowers the need for using chemicals and there is less or no environmental pollution which may affect non-targeted fauna and flora [1]. Some parasitoids are egg parasitoids; some are larvae while some are pupal parasitoids. *Trichogramma* spp. (Hymenoptera: Trichogrammatidae) are egg parasitoids, that contribute to natural mortality of stem borers. Hymenopteran parasitoids like *Cotesia* spp. have highly specialized ovipositors for depositing eggs and stinging purpose in the host. The sting leads to permanent paralysis in the host body [1]. *Trichogramma* spp. parasitizes eggs of stem borers while *Cotesia* spp.

parasitizes larvae of stem borer species [2]. Egg parasitism offers good control in that it stops the emergence of the damaging larval stage [1]**.** Predators are most important components of Integrated Pest Management (IPM). Ants (Hymenoptera: Formicidae) are the most important predators of stem borers in maize fields [3]**.**They are able to attack all stages of maize stem borers like larvae and pupae. According to [1]**,** *Componotus* spp. (Formicidae) and *Pheidole* spp. (Formicidae) appear to be the most important and common species. Ants of the genus *Lepisiota* were reported preying on eggs and larvae of stem borers [3]**.** Earwigs (Dermaptera) and ants were commonly seen preying on *C. partellus* [4]**.** Generally, the levels of stem borers parasitism by indigenous natural enemies complex are not satisfactory. The present study was evaluated to compare the natural enemy complex by determining their dominance coefficient.

II.MATERIALS AND METHODS

The present investigation was under taken in maize fields of Indore region. The selected areas of Indore region are as follows.



After the collection, description and identification of the parasitoids and predators, carried out with reference to the key [5]. The sequence of natural enemies collected from selected regions of Indore (Mangliya, Depalpur, Mhow and Sanwer) was counted and the proportion of a particular species out of the total (i.e., dominance coefficient) was determined [6]**.**

III.RESULTS

In the selected regions of Indore (Mangliya, Mhow, Depalpur and Sanwer), there are many recorded natural enemy complex (parasitoids and predators) of *C. partellus* collected during 2015 and 2016. Moreover, parasitoid number and the proportion of a particular species out of the total (i.e., dominance coefficient) were determined. The natural enemy complexes with their dominance coefficient are summarized in table 1-2 and are presented in figure 1-4.

During 2015, among the parasitoids *Trichogramma spp.* showed the highest dominance coefficient (36.31%) followed by *Cotesia flavipes* with the dominance coefficient of (27.05%) and among predators *Coccinella septumpunctata* showed the highest dominance coefficient of (14.80 %) and the least dominance coefficient was showed by *Pantala flavescens* (1.51%).

During 2016, among the parasitoids *Trichogramma spp.* showed the highest coefficient of dominance (51.03%) followed by *Cotesia flavipes* with the dominance coefficient of (33.24%) and among predators *Coccinella septumpunctata* showed highest coefficient of dominance (22.01 %). The least coefficient of dominance was showed by *Pantala flavescens* (4.87%).

The above mentioned result showed that the dominance coefficient of natural enemy complex varied in both 2015 and 2016. In comparison with the natural enemy complex recorded in 2015, the year 2016 showed highest abundance of natural enemies. This variation in the natural enemy complex may be due to rainfall patterns, moisture gradients and excessive heat. During both the years, Trichogramma spp. was at the uppermost peak followed by Cotesia flavipes and then by Coccinella septumpunctata. These species were common in all the selected regions of Indore, showing high to moderate effect on the mortality of eggs, larvae and pupa of Chilo partellus. Furthermore, Ants belonging to the family formicidae (Componotus spp and Pheidole spp.) were also common in all selected regions among the entire natural enemy complex.

IV.DISCUSSION

Biologists have illustrated the importance of natural enemies in the eradication of aphid populations at the field scale [7]**.** *Trichogramma spp.* (Trichogrammatidae) are small parasitoid wasps that act as a biological control agents of many lepidopterous insect pests. Several among them have been used victoriously in the management of insect crop pests [8]**.**One of the active biocontrol principal is *Trichogramma spp*. as it can manage the pest in the egg stage [9, 10] .These results are also in agreement with present study.

[11] studied the seasonal appearance of *Cotesia flavipes* on *C. partellus* larvae in Madhya Pradesh. [12,13] worked on diverseness and biocontrol nature of the genus *Cotesia*. Therefore, reported *Cotesia flavipes* as verygood substitute for pesticides in insect pest management. This work supports the present investigation.

[14] also were in agreement with present investigation and found that spiders and coccinellids were most Common species among predators complex followed by chrysopids and anthocorids and also recommended the role of *C. septempunctata* as dominant predator responsible for alteration in population of pests.

V.TABLES AND FIGURES

TABLE-1: Dominance coefficient of Natural enemies (parasitoids and predators) collected from the selected regions of Indore in 2015.

PARASITOIDS	
Species	**Dominance coefficient %**
Trichogramma spp.	36.31
Cotesia flavipes	27.05
Cotesia chilonis	14.23
Sturmiopsis inferens	10.34
Xanthopimpla stemmator.	7.83
Tetrastichus spp	4.63
PREDATORS	
Species	**Dominance coefficient %**
Coccinella septumpunctata	14.80
Chrysopa spp	14.50
Euborellia annulipes	13.29
Mantis religiosa	12.80
Reduviid bugs	11.17
Scolothrips spp	10.27
Pheidole spp.	10.01
Componotus spp.	9.46
Anthocoris spp	7.25
Syrphid spp.	4.83
Hyperaspis maindroni	4.22
Peucetia viridans	3.62
Nabis spp	3.32
Pantala flavences	1.51

TABLE-2: Dominance coefficient of Natural enemies (parasitoids and predators) collected from the selected regions of Indore in 2016.

PARASITOIDS	
Species	**Dominance coefficient %**
Trichogramma spp.	51.03

Cotesia flavipes	33.24
Cotesia chilonis	17.56
Sturmiopsis inferens	14.11
Xanthopimpla stemmator	9.50
Tetrastichus spp.	5.12
PREDATORS	
Species	**Dominance coefficient %**
Coccinella septumpunctata	22.01
Mantis religiosa	21.11
Chrysopa spp	19.07
Euborellia annulipes	17.12
Reduviid bugs	15.34
Scolothrips spp.	13.90
Anthocoris spp.	13.18
Syrphid spp.	11.42
Nabis spp	10.23
Hyperaspis maindroni	9.16
Pheidole spp.	9.10
Componotus spp	7.11
Peucetia viridans	5.05
Pantala flavescens	4.87

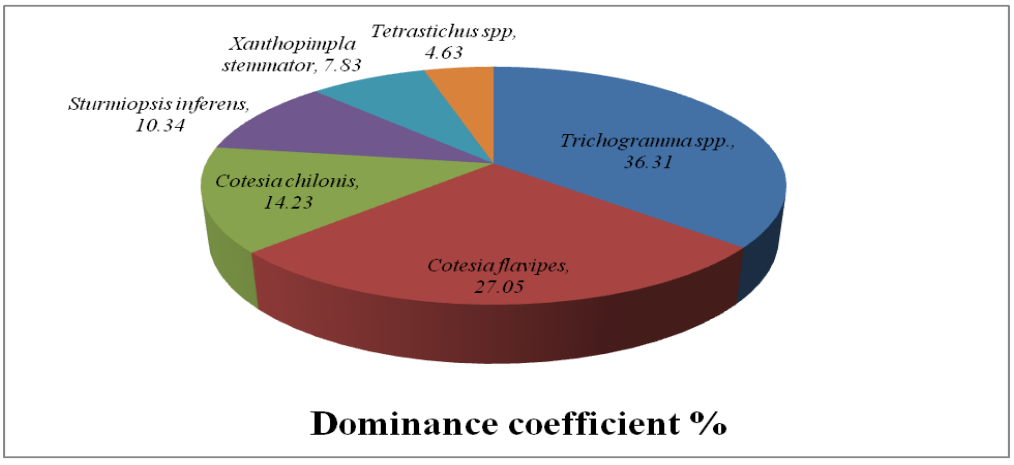


Fig-1: Dominance coefficient of Natural enemies (parasitoids) collected from the selected regions of Indore in 2015.

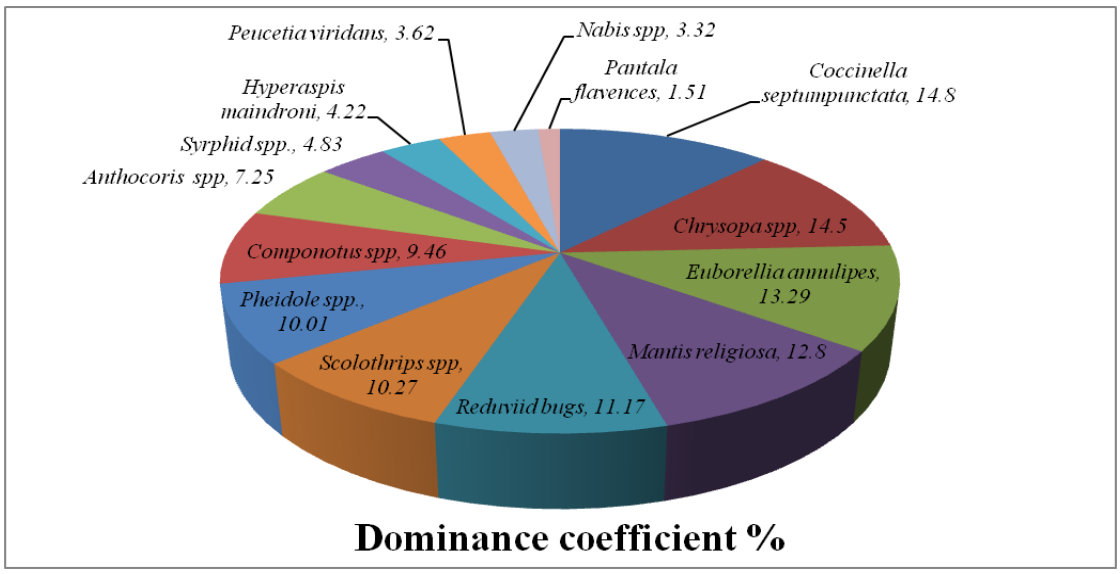


Fig-2: Dominance coefficient of Natural enemies (predators) collected from the selected regions of Indore in 2015.

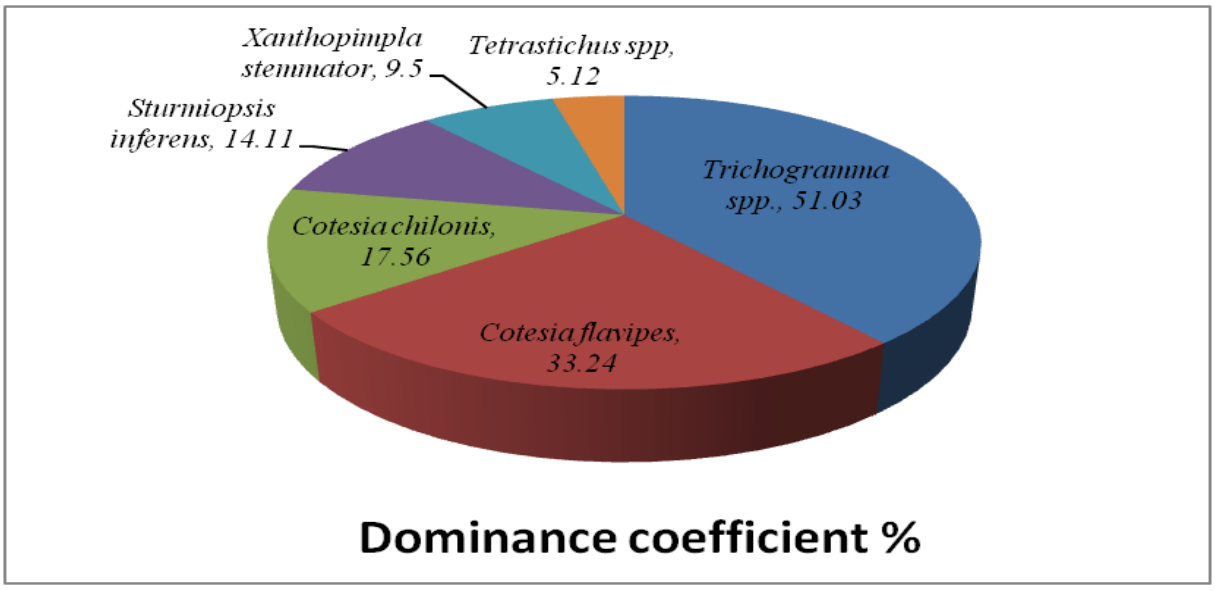


Fig-3: Dominance coefficient of Natural enemies (parasitoids) collected from the selected regions of Indore in 2016.

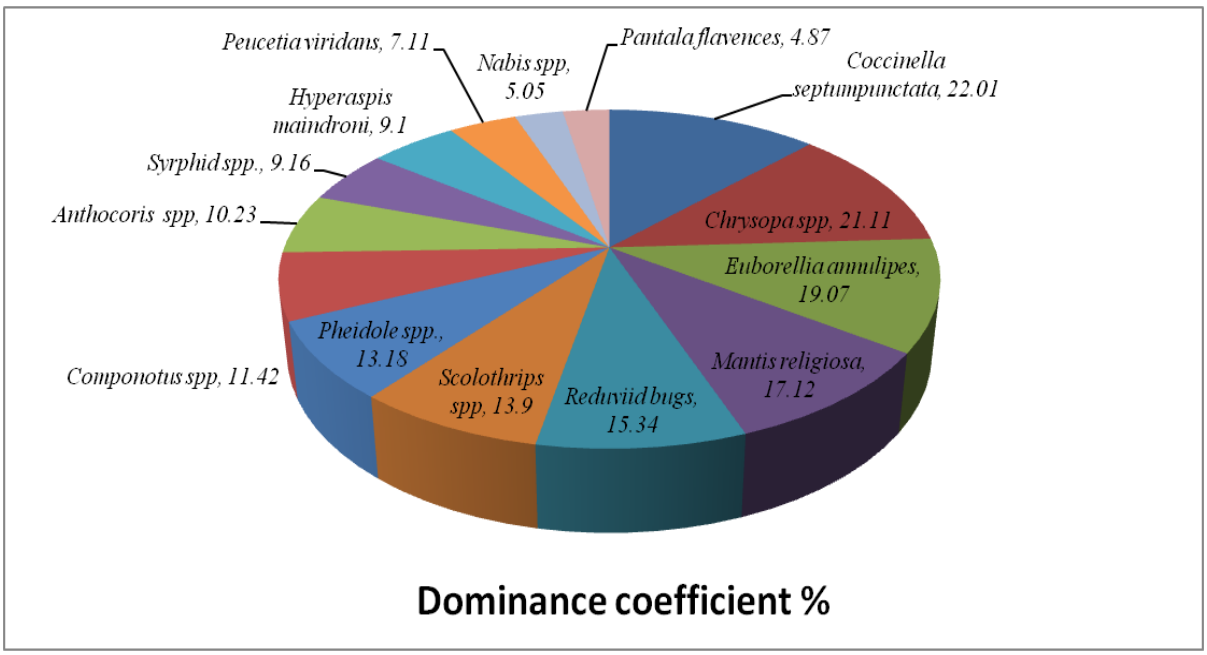


Fig-4: Dominance coefficient of Natural enemies (predators) collected from the selected regions of Indore in 2016.

VI.CONCLUSION

Overall, the abundance of natural enemies especially the predators and parasitoids, in the growing stages of the maize crop presents a challenge to insect pests management researchers to develop sustainable biological control conservation techniques. If successful in developing such optimized IPM, then it would help to manage outbreaks in populations of pests.

REFERENCES

[1] K. Mushore, Assessment of suitability of different populations of stem borer species for the development of *Cotesia flavipes* (Hymneoptera: Braconida) and the establishment of the latter in zimbabwe, thesis, *University of zimbabwe, 14.* 2005.

[2] D. Cugala, Introduction and establishment of *Cotesia flavipes* cameron (Hymenoptera: Braconidae) in Mozambique as a biological control agent against cereal stem borer in Mozambique. M. Phil. thesis. *University of Zimbabwe.* 2002.

[3] M. J. Bonhof, The impact of predators on maize stem borer in coastal kenya. Ph.d thesis, *wagenigen university,* 181. 2000

[4] G. Zhou, J. Baumgartner and W. A. Overholt, Impact of an exotic parasitoid on stem borer (Lepidoptera) population dynamics in Kenya. *Ecological Applications,11, 2001, 1554-1561*

[5] W.A. Overholt, K.V.N. Maes and F.R. Goebel, Field guide to stemborer larvae of maize and

Sorghum.*ICIPE Science press. (Nairobi, Kenya), 31. 2001*

[6] Z. Asma, A .A. Buhroo, B. Mohamed and B. Mohamed, Laboratory observations of *Raphitelus maculatus* walker 1834 (hymenoptera: chalcidoidea) a parasitoid of the almond bark beetle *Scolytus amygdale, Guerin meneville* (Coleoptera: Curculionidae) in Tunisia. *International journal of entomology, 2(1), 2015,71-74.*

[7] P. Dennis and S.D. Wratten, Field manipulation of populations of individual *Staphylinid species* in cereals and their impact on aphid populations. *Ecol. Entomol, 16, 1991, 17-24.*

[8] D.J. Borror, D.M. Delong and C.A. Triplehom, An introduction to the study of insects. *Saunders college publishing,827. 1981*

[9] J.P. Bournier, Behaviour of various strains of *Trichogramma* towards eggs of *Heliothis armigera* Hbn (lep: noctuidae) and *Chilo partellus* Swinhoe (lepidoptera: pyralidae). les *Trichogrammes. Ier symposium International, 1982 85-96.*

[10] A.K. Somchoudary and N. Dutt, Influence of host and host ages on the biomics of *Trichogramma perkinsi* Girault and *Trichogramma australicum* Girault. *Indian journal of entomology, 50(3),1988, 374-379.*

[11] R.D. Barpete and C.B. Shinde, Seasonal occurrence of *Apanteles flavipes* (cameron) on *chilo partellus* (swinhoe) in Madhya Pradesh. *J. Insect Sci,4,1991,112-116.*

[12] T.V. Sathe and S. Nilam, Braconids in pest management : life cycle of *Aplantelas sundanus* wilkinson (Hymenoptera : Braconidae) an internal larval parasitoid of castor semilooper *Achea janta* Linneaus (Lepidoptera: Noctuidae). *In. Recent trends in biological pest control (ed.),1,2014,120-125.*

[13] M. Sutar, T.V. Sathe, Diversity and biocontrol of the genus *Diadegma forster* (Hymenoptera: Ichneumonidae) from western maharastra. *Biolife, 4(1), 2016, 202-208*

[14] K. Ghoneim, Predatory insects and arachnids as potential biological control agents against the invasive tomato leaf miner, *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae) in perspective and prospective. *Journal of Entomology and Zoology Studies, 2 (2),2014,52-71.*