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Portfolio function of lady bird beetles (Coccinellids) in the agro forestry ecosystem of Kanke block, Ranchi district (Jharkhand), India

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Abstract- Portfolio function of any biotic population in an ecosystem has multidimensional control & it is primarily engineered by S-W diversity index of the species. S-W diversity index is popular statistical information index as quantitative tool to assess the species abundance, richness & bifold product value of group of species dwelling together in a habitat that yields significant result for understanding their asset & liability value in the portfolio of biotic community. It further helps in contemplating the strategies for the management & development of sustainable environment & ecosystem. Beetles sampled from the forest, agricultural areas & grasslands of Kanke block in Ranchi of Jharkhand were taxonomically identified as *Coccinella septempunctata* L., *Brumus suturalis*, *Adalia decempunctata* Linn., *Cycloneda sanguinea*, *Cryptocephalus triangularis*, Hope & *Hippodamia parenthesis.* When the data were subjected to S-W diversity index tool, the value of H (H= -Σpi*log pi) for all the species of beetles was found to be 0.7691, 0.7625 & 0.7616 and PF (Portfolio Index) as 104.0, 19.67 & 78.7 which indicates that they have profitable asset investment in the community. as per portfolio function laws.

Key words: S-W diversity, lady bird beetles, profitable asset investment, portfolio function laws, agroforestry ecosystem

INTRODUCTION

Insects are one of the most diversified group of fauna found in over all parts of the world.[1] Insects pests constitute a very serious problem in our country. According to Sir Walter Morley Fletcher "at a very modest estimate, the losses caused to India by insects that attack crops, timber and animal products cannot be estimated as less than 200 crores of rupees and a loss of over a million and a half of human lives". Four types of defense mechanism such as mechanical, cultural, chemical and biological has been developed by the entomologists to prevent the injurious insects becoming abundant. Hence the biological control is based on the assumption that number of insect pests is usually destroyed by insect only acting as predators or parasites. Family Coccinellidae are among those group which acts as predators for most of the insects that come under the order Coleoptera. These are a group of small beetles that usually renges in size 0.8 to 18 m.[2] In Northern America this family is known as ladybugs & in Britain and other parts of the world it is known as ladybirds. Usually the entomologists call this insect as ladybugs or ladybeetles since these insects are not classified as true bugs.[3]

Thus the family in which these insects belong are very diverse in habitat & are found in all types of terrestrial

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ecosystem. They are one of the most important group of the natural predatory of many horticultural and agricultural crop pests such as aphids or scale insects.[4,5] Many coccinellids have been seen laying their eggs directly in aphid and scale insect colonies in order to ensure their larvae have an immediate food source.[6] Coccinellidae are generally yellow, orange, or red in colour with small black spots on their wing covers, with black legs, heads and antennae. However, much variation has been seen in their colour pattern and spot. For example, a minority of species, such as *Coccinella septempuctata* L have seven black spots on their back while *Vibidia duodecimguttata*, is twelve-spotted species, have whitish spots on a brown background. Coccinellids are found worldwide, with over 6,000 species described and dived into six subfamilies: Sticholotidinae, Chilocorinae, Scymninae, Coccidulinae, Coccinellinae and Epilachninae.[7,8] Here in this paper attempt has been made to study on the portfolio function of the lady bird beetle in forest, agricultural & grassland areas of Kanke since these insects are eco friendly in nature their availability is very important for maintaining balanced ecosystem.

MATERIAL AND METHODS

For the study of portfolio function of Coccinellidae, collection of the samples were done from agro forestry and grassland habitats of Kanke block present in Ranchi district which is situated in north-eastern part from the main city consisting of 90 acres of land under forest ecosystem that is integrated into agricultural management systems. Specimens were collected by using net, hand picking and light trap; one light trap per 10 unit qudrates for all the three sites. These collected species were then identified using Imm's book of entomology & Modern Entomology. Study was conducted from three different sites & was visited once in every fifteen days. The data collected from the above findings have been given in table number 1, 2 & 3. On the basis of the procurred data,species diversity by S-W index & portfolio function index(PFI) by linear divident method were calculated.

Table 1: Portfolio function of lady bird beetle in crop habitat (paddy, wheat, gram, moong)

Sl. No.	Names of lady beetles sampled	Avg. number of individuals per unit quadrate (n)	individual abundance pi(n/N)	Relative abundance % (pi=n/N* 100)	log pi	pi*log pi	H	Per quadrate average no. of host plants (paddy, wheat, gram, moong)	PF index = per quadrate avg. no. of host plants/diversity value of lady beetles
1	*Coccinella septempuctata* L	60	0.218	21.8	-0.661	-0.1440		80	
2	*Brumus suturalis*	49	0.178	17.8	-0.749	-0.1333		80	
3	*Adalia decempunctata* Linn.	30	0.109	10.9	-0.962	-0.1048	**0.7656**	80	**80/0.7656=104.4**
4	*Cycloneda sanguinea*	48	0.174	17.4	-0.759	-0.1320		80	
5	*Cryptocephalus triangularis* Hope	52	0.189	18.9	-0.718	-0.1357		80	
6	*Hippodamia parenthesis* Say	36	0.130	13.0	-0.886	-0.1158		80	
	Grand Total (N)	275							

Table 2: Portfolio function of lady bird beetle in forest area(Acacia, Peepal, Gamhar)

Sl. No.	Name	Avg. number of individuals per unit quadrate (n)	individual abundance pi (n/N)	Relative abundance % (pi=n/N* 100)	log pi	pi*log pi	H	Per quadrate average no. of host plants (Acacia, Peepal, Gamhar)	PF index =per quadrate avg. no. of host plants/diversity value of lady beetles
1	*Coccinella septem puctata* L	45	0.211	21.1	-0.675	-0.1424		15	
2	*Brumus suturalis*	31	0.145	14.5	-0.838	-0.1215		15	
3	*Adalia decempunctata* Linn.	20	0.093	9.3	-1.031	-0.095		15	
4	*Cycloneda sanguinea*	35	0.164	16.4	-0.785	-0.1287	**0.7625**	15	**15/0.7625=19.67**
5	*Cryptocephalus triangularis* Hope	42	0.197	19.7	-0.705	-0.1388		15	
6	*Hippodamia parenthesis* Say	40	0.187	18.7	-0.728	-0.1361		15	
	Grand Total (N)	213							

Table 3: Portfolio function of lady bird beetle in grassland (small wild herbs, grasses, puttus, bhangaria)

Sl. No.	Name	Avg. number of individuals per unit quadrate (n)	individual abundance pi (n/N)	Relative abundance % (pi=n/N* 100)	log pi	pi*log pi	H	Per quadrate average no. of host plants (small wild herbs, grasses, puttus, bhangaria)	PF index =per quadrate avg. no. of host plants/diversity value of lady beetles
1	*Coccinella septempuctata* L	40	0.220	22	-0.657	-0.1445		60	
2	*Brumus suturalis*	23	0.127	12.7	-0.896	-0.1137		60	
3	*Adalia decempunctata* Linn.	19	0.104	10.4	-0.982	-0.1021		60	60/0.7616= 78.7
4	*Cycloneda sanguinea*	28	0.154	15.4	-0.812	-0.1250	0.7616	60	
5	*Cryptocephalus triangularis* Hope	33	0.182	18.2	-0.739	-0.1344		60	
6	*Hippodamia parenthesis* Say	38	0.209	20.9	-0.679	-0.1419		60	
	Grand Total (N)	181							

The host plants on which beetles were found wriggling freely have also been identified & recorded to consider the available food resource for the beetles in the selected habitats (cropland, agricultural areas & grasslands)

RESULT AND DISCUSSION

The concept of 'portfolio function' is completely based on financial management of different types of fund investment fetching various returns in the terms of yields. The term function in portfolio management is the ultimate result of asset and investment added to liability expenses in a specific slot of time & space. When this concept is applied to ecological research, it provides an important insights into how ecosystems are organized in different habitats & how biotic species are interrelated in terms of autotrophs-heterotrophs, producers-consumers & managers-employees relationships. The holistic trends of evolutionary strategies of any community emerge on these parameters which predict the development of the environment & nature. It can also help in providing appropriate measures for developing management and conservation schemes, and offer an approach that does not rely on prescriptive predictions about threats in an uncertain time scale.

In the present investigation, 6 different species of lady bird beetles from three different habitats were sampled during the experimental year 2018-2019 & identified as- *Coccinella septempuctata* L, *Brumus suturalis*, *Adalia decempunctata* Linn., *Cycloneda sanguinea*, *Cryptocephalus triangularis* Hope & *Hippodamia parenthesis,* which were present in different degree of abundance depending upon the availability of various host plants as food resources. In habitat 1 (crop land), where large number of paddy, wheat, gram & moong plants were available, the S-W diversity value of all the six lady beetle species have been found to be 0.7656 sponsored by average 80 number of plants per 10 unit quadrates as food resource. Hence the portfolio function index of these beetles in relation to the host species was 104.4. Similarly in habitat 2 (agricultural area), where average number of Acacia, Peepal & Gamhar trees were available, the S-W diversity value of all the six lady beetles species have been found to be 0.7625 sponsored by least 15 number of trees per 10 unit quadrate as food resource. Hence, the portfolio function index of these beetles in relation to the host species was 19.67. As well as in habitat 3 (grassland area), where number of small wild herbs, grasses, Puttus, Bhangaria were available, the S-W diversity value of all the six lady beetles species have been found to be 0.7616 sponsored by average 60 number of plants per 10 unit quadrate as food resource. Hence, the portfolio function index of these beetles in relation to the host species was 78.7.

Comparatively the performance of these six lady beetle species as reflected by different values of habitat specific portfolio function index which was highest in habitat 1 followed by habitat 3 while it was lowest in habitat 2. Therefore, the habitat 2 remains to be more properly managed in terms of host plants & the predatory beetles whereas the remaining two habitats enjoy comfortable & rich environmental ecosystem leading to good production of crops & useful grassland species where the predatory beetles remained busy in destroying the harmful pests of the plants & scavenging the undesirable pathogens of the habitats. Thus computing the portfolio function index on the basis of S-W diversity index of any group of species in relation to the habitat resources provides significant indication about the wellbeing of the habitat.

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REFERENCE

1. **D.B Tembhare 2016.** Modern entomology, *Himalaya Publishing House.* **2:**286- 304
2. **Seago, A. E.; Giorgi, J. A.; Li, J.; Slipinskia, A. July 2011.** "Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data". *Molecular Phylogenetics and Evolution.* **60(1):** 137-151.
3. **White, R.E. 1983.** A field guide to the beetles of North America. Peterson Field Guide.
4. **Dixon AFG. 2000.** Insect Predator-prey Dynamics Ladybird Beetles and Biological Control. Cambridge University Press, Cambridge, United Kingdom, 1-257.
5. **Omkar VB, Pervez A. 2000.** New record of coccinellids from Uttar Pradesh. *Journal of Advanced Zoology.* **21(1):**43-47
6. **Society, National Geographic.** "Ladybugs, Ladybug Pictures, Ladybug Facts - National Geographic"
7. **Judy Allen & Tudor Humphries. 2000.** Are You A Ladybug?, Kingfisher, p. 30
8. **Seago, Ainsley E.; Giorgi, Jose Adriano; Li, Jiahui; Slipinski, Adam 15 March 2011.** "Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data" (PDF). *Molecular Phylogenetics and Evolution.* **60:**137 151.

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