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Research Article

COMPARISON OF BIOCHEMICAL EFFECTS OF PSIDIUM GUAJAVA UPON FENVALERATE AND CYPERMETHRIN INFECTED *CLARIAS BATRACHUS* (LINNAEUS, 1758)

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(Linnaeus, 1758).

ABSTRACT

Fenvalerate and Cypermethrin used as insecticide or pesticide are toxic agents compared after the application of herbal agent *Psidium guajava* upon Catfish *Clarias batrachus* (Linnaeus, 1758). Both toxic agents showed toxicity whereas *Psidium guajava* gave some recovery effect upon pesticidal infected Catfish. Fishes were exposed to the concentration of pyrethroid insecticide Cypermethrin for 24h as the LC50 value was found to be (1 µg/l) and one fourth of LC50(0.25 µg/l) was selected. The other insecticide Fenvalerate concentration for 24 h was LC50 (250 µg/l) and one tenth of LC50 (25 µg/l) as lethal concentration for acute toxicity studies. Doses followed till 96 h at each time interval of 24 h. The dose of herbal given for 24 h was 9 gm for 1.5 kg body weight of fish. Biochemical changes were observed in all five Normal, Fenvalerate, Cypermethrin, FenPg and CypPg stages.

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INTRODUCTION

Pesticides used widely for preventing, destroying or repelling any organism that may be considered harmful. Commonly found in commercially grown fruits, vegetables and meats. Both Fenvalerate and Cypermethrin which are used as pesticide and insecticide produce some harmful effects that can influence the impairment of the oxygen transport and leads to help in the destruction of blood and immune system.

Cypermethrin is very toxic for fish in laboratory tests 96h LC50 were generally within the range of 0.4–2.8 µg/l and aquatic invertebrates LC50 in the range of 0.01–5 µg/l. Significant changes as hyperplasia, disintegration of hepatic mass, focal coagulative necrosis in *Labeo rohita* exposed to cypermethrin (Sarkar *et al.*, 2005). Mortality has been observed after exposing the fish to different concentrations of Cypermethrin for 96h. The LC50 has been found to be 4.789 mg/l and one-tenth of LC50 (0.4789 mg/l) has been selected as sub-lethal concentration for sub-acute studies. Oxygen consumption has been determined in both lethal and sub-lethal concentrations (David *et al.*, 2003). In the liver of *Labeo rohita* exposed to sublethal concentrations (1/10th of 24h LC50) of fenvalerate technical grade for ten days, the changes observed include vacuole formation, hepatocytes became

indistinguishable giving rise to a number of intercellular empty spaces with mesh like appearance. This may be probably due to disintegration of lattice fibres, which support the hepatic cells. Degenerative changes in the peripancreatic tissue and blood congestion (blood appeared as streak) among hepatocytes were evident (Anita *et al.*, 2012). Longer exposure (96 h) to even a lower concentration (1.4 µg/L) of fenvalerate resulted in reduction of all the parameters (except Hb%) tested as compared with control (Bhattacharyya and Kaviraja, 2009).

Psidium guajava or Guava used in folk medicine, their extracts of roots, bark, and leaves are used to treat gastroenteritis, vomiting, diarrhoea, dysentery, wounds, ulcers, toothache, coughs, sore throat, inflamed gums, and a number of other conditions (Morton, 1987). The leaves of *Psidium guajava* contains the flavonol-morin, morin-3-O-lyxoside, morin-3-O-arabinoside, quercetin and quercetin-3-O-arabinoside (Pongsak *et al.*, 2007).

METHODOLOGY

Fish

Clarias batrachus weight 400-600 gm and average length of 40-45 cm adult catfish were collected from fish market and acclimatized for 4 days i.e. 96h in water tank in normal

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environmental condition were fed daily with wheat flour mixed mincer pellets and commercial pedigree.

Chemicals and Method

Fishes were randomly selected in equal numbers and put in two different water tanks exposed with Fenvalerate and Cypermethrin. The stock solution concentration was used as 20EC for toxic agents. The concentration of Cypermethrin was taken as LC50 1/4 for 24h, was found to be 0.25 µg/l and for Fenvalerate as LC50 1/10 for 24 h, was 25 µg/l, which was continued for 96h of every 24h of time interval as lethal concentration for acute toxicity studies. The herbal dose of *Psidium guajava* was used was 9 gm for 1.5 kg body weight of fish for 24h upon fish infected with both pesticidal agents individually.

Water changed at every level of Normal, Fenvalerate, Cypermethrin, FenPg and CypPg. There was no sacrifice of fishes done. Fishes were brought unconscious to stage by the help of anesthetic agent during withdraw of blood and then put in fresh water tanks in consciousness stage. Biochemical changes were observed and compared with each other among Normal, Fenvalerate, Cypermethrin, FenPg and CypPg condition.

RESULT AND DISCUSSION

During the biochemical examination different changes observed in *Clarias batrachus* at all five conditions shown in Table-1.

Table 1 Biochemical Results

Test Observation	Normal	Fen	Cyp	Fen Pg	Cyp Pg
Bilirubin(0.08-1.02 mg/dl)	0.11	0.05	0.06	0.08	0.1
ESR(20-34 mm)	22	10	22	22	20
SGOT AST(155-162.7 U/L)	161.5	72.4	261	97.1	135.5
SGPT ALT(40.17- 54.01 U/L)	45.3	31.3	48.7	40	38.1
Post Prandial Plasma Glucose(109.8- 184.5 mg/dl)	151.6	71.4	271.9	121.84	40.93

Fish affected with Fenvalerate

Bilirubin (Total Serum), ESR, SGOT (AST), SGPT(ALT), Post Prandial Plasma Glucose (After Meal) all were below their Lower Standard Limit and are more significant towards the toxicity of Fenvalerate.

Fish affected with Cypermethrin

Bilirubin (Total Serum) found below from its LSL range, whereas, ESR and SGPT (ALT) were under the normal range and non-significant towards toxicity. SGOT (AST) and Post Prandial Plasma Glucose (After Meal) both showed their harmful effects and were far away from their Upper Standard Limit range.

Fish administered with Herbs

After applying herbal agent *Psidium guajava* on fish affected with toxic agent, biochemical results showed the sign of recovery of Bilirubin as test observations came into the normal range between LSL and USL. As Cypermethrin is nontoxic for ESR shown in Table 1, hence result of CypPg was also under the nontoxic range limit. Table 1 showed the significant recovery of ESR with FenPg as result came within its normal

range. Result of FenPg and CypPg were away from normal range, and did not show sign of recovery of SGOT. After application of *Psidium guajava* on fish affected with Fenvalerate, a sign of recovery of SGPT ALT observed as test result approached towards the normal range. In case of CypPg, it was not considered as recovery agent since Cypermethrin did not had toxicity effect on SGPT. Test result of CypPg showed toxic sign upon SGPT. Test result of FenPg remained between LSL and USL of PPPG which showed its significant in nature of recovery of PPPG as shown in Table 1.

The toxicity of Fenvalerate and Cypermethrin on the catfish showed that both pesticides had harmful effects and disturbed their biochemical ranges. On the other side, recovery sign also seen in some parameters after application of herbal. The fluctuation of test results observed during the experimental research are shown in Graph 1-5.

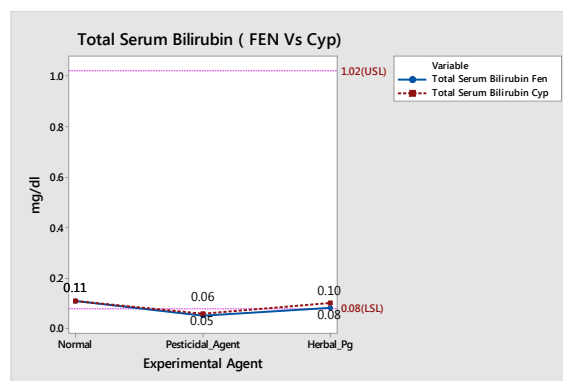
Experiment by Pachanawan *et al.*, (2008) observed that in a pathogenicity test, the median lethal dose (LD50) of *A. hydrophila* for tilapia (*Oreochromis niloticus*) by intraperitoneal injection was 3.44x10⁶ CFU/ml. *In vivo* experiments showed that fish diets containing either dry leaf powder of *P. guajava* or dried ethanol extract of *P. guajava* leaf reduced mortality of *A. hydrophila* infected tilapia with no detected adverse effect on the fish. This study suggests that *P. guajava* leaf has the potential to control fish diseases caused by *A. hydrophila*.

Results of Biochemical parameters of blood of fish after application of herbal agents were observed which are discussed as below:

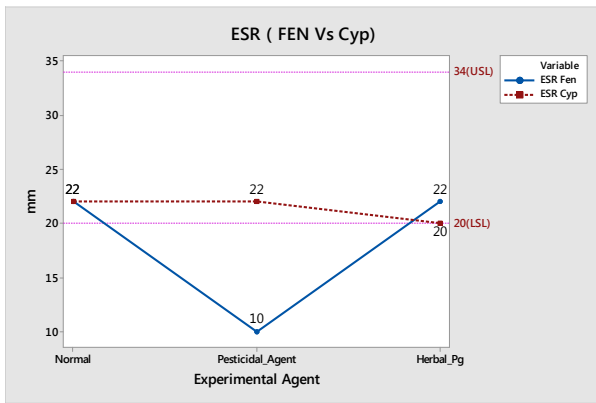
CypPg and FenPg are significant as recovery agent for Bilirubin, whereas Cyp does not show toxicity for ESR and SGPT. After application of herbal agent *P. guajava*, CypPg follows the nontoxic nature for ESR but becomes toxic for SGPT. All four agents (two pesticides and two herbal) show toxicity for SGOT.

In case of SGPT, test results show that Fen is toxic and Cyp is nontoxic for it. After application of *Psidium guajava* upon both of the pesticides, it is found that Fen Pg shows sign of recovery of SGPT whereas CypPg becomes toxic for it.

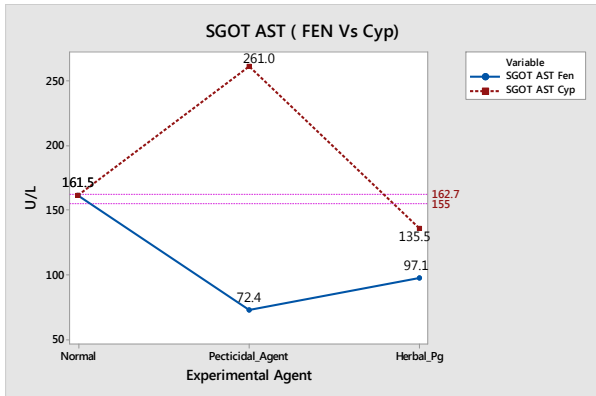
In Post Prandial Plasma Glucose (After meal), both pesticides are toxic and after application of *Psidium guajava*, test result of Fen Pg shows as significant recovery agent for PPPG whereas CypPg shows toxicity for it.



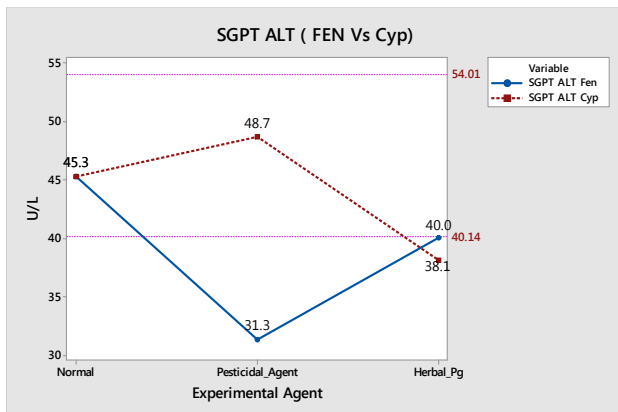
Graph 1 Comparison of Total Serum (Bilirubin)



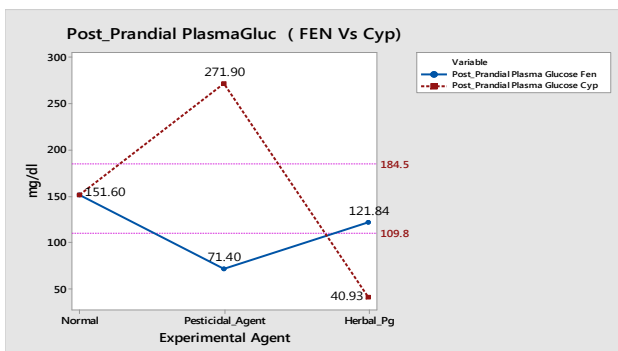
Graph 2 Comparison of ESR levels



Graph 3 Comparison of SGOT(ALT) levels



Graph 4 Comparison of SGPT (ALT) levels



Graph 5 Comparison of Post Prandia Plasma Glucose (After Meal) levels

CONCLUSION

The whole experiment shows that Fenvalerate and Cypermethrin both are toxic and also are very dangerous for

fishes when used at the dose of one tenth of LC50 (25 µg/l) in Fenvalerate and one fourth of LC50 (0.25 µg/l) in Cypermethrin. The dose of herbal given for 24 h was 9 gm for 1.5 kg body weight of fish which shows significant recovery. Some of the biochemical blood parameters FenPg is significant in recovery of Bilirubin, ESR, SGPT and PPPG, whereas CypPg is significant in recovery of Bilirubin. Hence from present research study it can be concluded that the herbal dose of *Psidium guajava* is more beneficial for recovery of biochemical blood parameters of catfish infected with Fenvalerate (*Clarias batrachus*).

Glossary

- Cyp- Cypermethrin
- Fen- Fenvalerate
- CypPg-Addition of *Psidium guajava* in Cypermethrin
- FenPg- Addition of *Psidium guajava* in Fenvalerate
- Pg- *Psidium guajava*
- LSL- Lower Standard Limit
- USL- Upper Standard Limit
- PPPG- Post Prandia Plasma Glucose

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