International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

# Effect of Insecticides and Synthetic Fertilizers on Gramineae Family

**Akshita Sharma[1], Alibha Rawat[2], N. Ganesh[3]**

[1, 2]Department of Research, JNCHRC, Idgah Hills, Bhopal, Madhya Pradesh, India

[3]Department of Research, JNCHRC, Idgah Hills, Bhopal (Corresponding Author)

**Abstract:** ***Introduction: Gramineae family is also known as poaceae and it is the most important plant family for food production. Some of the widely cultivated grains are rice, wheat, corn, barley, rye, oats, pearl millet, finger millet and tef. It is thus the major source of food worldwide but the overuse of insecticides for managing and controlling insects and synthetic fertilizers for improving the soil fertility have had a detrimental role on the quality of this plant and have directly affected the health of human kind to a large extent. Method: The current review work summarizes and analyzes the studies done to evaluate the effect of some insecticides and chemical fertilizers on graminae family by intensive electronic search by Cochrane, PubMed and EMBASE. Some selected published works were thoroughly analyzed to understand and get insight on the above-mentioned topic. Result: The studies revealed the specific effects of specific insecticides and fertilizers on plants from this very important crop plant.***

**Keywords:** Crop, Fertilizers, food quality, Gramineae, insecticides

## 1. Introduction

**Effect of some insecticides and fertilizers on graminae family**

The effect of DNP on barley (*Hordenum vulgare*) was studied by **Elena Todirascu Ciornea*et. al.,*** as early as**1957.** DNP and its derivatives showed long-lasting effect on the environment, still these are used on large scale in fields as insecticide, pesticide, ovicide, fungicide and weed killer due to its various biological functions. *Hordenum vulgare* (barley) is a grass tolerant to different stress conditions and is a rich source of glucan, tocols and polyphenolic compounds and hence is widely used as source of food for humans and animals. To evaluate the effect of DNP and $KIO_3$, different viability tests for barley seeds were performed, which showed hazardous effect at high concentrations.

To check the activity of dinotefuran, a third generation neonicotinoid insecticide, against brown plant hopper in farmer's field at West Bengal, India during kharif crop season, some experiments were performed by scientists. In these experiments seven treatments contained four doses of dinotefuran at 15, 20, 25 and 3 gai/ha imidacloprid at 25gai./ha and acephate at 400gai./ha along with untreated check were tested following randomized block design with three replication. It was revealed that the performance of dinotefuran was very effective against the BPH population than the commonly used neo–nicotinoids. Dinotefuran 20 SG against BPH was very efficient and do not show any damage or harmful effects on the other predators recorded to be present in rice field. *In vitro* conditions the LC50 value of dinotefuran at 24 h was 0.415ppm. **(A. Ghosh *et.al.*, 2014).**

Another recent study was conducted on the effect of dinotefuran on rice (*Oryza sativa*) by **Sujay Hurali *et. al.*, 2020.** Rice belonging to the gramineae family is one of the most important food crop in the world but several pests such as brown plant hopper, white backed plant hopper, green leaf hopper and leaf folder causes damage to the crop on an annual basis. Damage can be in the form of reduced or stunted plant growth, wilting and leaf chlorosis. In order to control these plant hoppers dinotefuran, a third generation insecticide of neonicotinoid group, was developed by Mitsui chemicals. While it is a very effective pesticide its harmful effect on the quality of plant was an issue. Thus, the study was done to evaluate the bio-efficacy of dinotefuran in controlling the rice brown hopper in *in vitro* conditions.

Urea is one of the most common fertilizers used worldwide including India due to its enriching nitrogen content. One such study was done by**Enas Ahmed Ali Jbreel, (2016)** to check the effect of urea fertilizer on the vegetative growth, herbage yield and oil content of lemon grass. Lemon grasses are produced on a large scale and the global demand is about 4500 tonnes/annum. It's a traditional food widely used for its flavoring quality. Urea increases the vegetative growth and oil content of lemon grass but it also has its harmful effect. In the experiment sample (with 1.0, 2.0, 3.0, 4.0 and 6.0g of urea/plant) and control (no urea) was used. It was found out that there was significant difference in oil content in first cut after treatment with fertilizer, while there was little effect on second cut with respect to oil.

**Anjil Kumar *et.al.*, in 2008** evaluated genotoxicity of various concentration of insecticide, profenophos at various stages of cell cycle by using the seeds of barley. The main aim of their work was to determine the consequences of insecticide profenophos at various stages of cell cycle on germination, seedling height and meiotic behavior in $M_1$ and chlorophyll mutation in $M_2$ generation. They concluded that the S-phase of cell cycle is more than the other phases of cell cycle when treated with profenophos.

**Pragyan Dubey *et.al.*, in 2015** conducted an experiment to investigate the effects of chloropyrifos (cp) and propiconazole (pz) on barley. In that experiment, they treated barley seeds with three concentration of cp and pz, i.e., 0.05% ,0.1%and 0.5% for 6 hours after presoaking them

for 7, 17 and 27 hours. Different timings for presoaking showed three phases of the cell cycle i.e., $G_1$, S and $G_2$. Double distilled water was used as negative control and ethyl methyl sulphonate was used as a positive control. When a comparative study was performed between the control and test sample, a significant reduction in germination percentage, seedling height and mitotic index and increase in chromosomal aberrations like dispersion, adhesiveness, bridges, multipolar anaphase and diagonal anaphase was observed against both the pesticides in the treated root tip of meristematic cells of barley. It was observed that pz-induced chromosomal aberrations occur less commonly than cp-induced aberrations and thus pz has low probability to cause genotoxicity in barley.

**Meghraj M *et.al.*, in 1989** performed an experiment to determine the growth of a green alga and two cyanobacteria (isolated from a rice soil) under the influence of methyl carbamate insecticides, carbofuran and carbaryl. These were checked for their effects on a green unicellular alga, *Scenedesmusbijugatus*, and two cyanobacteria, *Synechococcuselongatus* and *Nostoclinckia*. In *in vitro* conditions, the cell number of *S. bijugatus* was remarkably increased on the application of both insecticides up to 20 $zgml^{-1}$ concentration. *Synechoccuselongatus* was highly sensitive, $5/\sim gml^{-1}$ of each chemical being lethal. When researchers applied carbofuran and carbaryl in concentration up to 20 or 50 gm $l^{-}$ initially the cholorophyll, content in *N. linckia* was increased which again led to a subsequent inhibition. Eventually, they deduce that carbaryl was more toxic than carbofuran to all the test organisms.

Gut enzyme activity of larvae of the rice leaf folder *Cnaphalocrocismedinalis* (guenee) under the influence of botanical insecticides and bacterial toxins was tested by **S. Senthil Nathan *et.al.*, in 2004.** Bacterial toxins and botanical insecticides in combination or alone can change the gut enzyme activity. When rice treated with bacterial toxins and botanical insecticides were fed by rice leaf folder in bioassays, the performance of gut tissue enzyme–acid phosphatase (ACP), alkaline phosphatase (ALP) and adenosine tri-phosphatases (ATPase) was altered. In combination of both, insecticide and bacterial toxin, the effect was more drastic at a low concentration. On the exposure of larvae with insecticides and toxins, there was a reduction in weight and in ACP, ALP and ATPase activities. At last they inferred that bio-pesticides are safe, bio-degradable, less expensive, easily available and can be used as a substitute of organic and inorganic pesticide in controlling RLF.

Nitrogen-fixing bacteria were taken into consideration to know the effect of chemical fertilizer and toxicities of two carbamate insecticides, carbaryl and carbofuran at partially lethal level. In control cultures, the typical number of vegetative cells between two polar heterocytes was 16.3. While in the presence of inorganic fertilizers, the mean filament length was increased. According to them, urea at high concentration level (50 ppm) was acting as growth inhibitor and at low concentration it was acting as growth promoter while at 100 ppm it was showing antagonistic properties. From the above studies, it was concluded that the inorganic fertilizers used were antagonistic on cylindrospermum species **(Rabindra N. Pandey, *et. al.*, 2014).**

A big loss of quality and quantity of winter wheat is suffered due to damage caused by orange wheat blossom midge. **Nabil E.El-wakeil *et. al.*,** in **2013** studied the activity of wheat blossom midges, *Sitodiplosismosellana* and *Contariniatritici* using pheromone, sticky traps and two types of water traps. Different chemicals such as karate (pyrethroid), Bis-caya (neonicotinoid) and Neem Azal T/S (botanical insecticide) were sprayed to know their effects on midges. A wheat midge was examined before the treatment and the observation was continued for 4 weeks after the treatment. The number of wheat midges in treated and untreated winter wheat was significantly different; the number of wheat midges was less in the treated winter wheat than the control, so in the end researchers proved that both karate and biscaya was more lethal to wheat midges than Neem Azal T/S.

A field experiment was conducted in experimental farm of Bihar Agricultural University, Bhagalpur by **Asheesh Chaurasiya *et. al.*, in 2018** during the rabi season of 2014-2015 to evaluate the performance of wheat under high temperature, stress condition and under the influence of synthetic compounds. Treatments were carried out in split plot design with three replications. In the main plot, two contrasting varieties of wheat, i.e; DBW-14 (timely sown) and K307 (late sown) were kept. Subdivision of main plot into fourteen subplots, those were receiving foliar spray of different synthetic compounds either at a fixed dose at booting stage or at anthesis stage or half the fixed dose at both booting and anthesis stage. Different stages for the foliar spray were given at different stages. On receiving foliar spray of $KNO_3$ at the rate of 0.5% both during booting and anthesis stage over no foliar spray the grain yield was maximum and significantly higher. Same results were obtained when foliar spray of CaCl was used. Thus they concluded that foliar spray of $KNO_3$ at the rate of 0.5% during booting and anthesis in a short duration DBW -14 is valuable to mitigate the bad effect of high temperature – stress and boosting the yield to a profitable limit.

Different insecticides were applied on barley crop against aphid (rhopalosiphummaidis) and the highest number was founded in untreated control(81.23/tiller). It was revealed that the highest seed yield was recorded in the plots treated with imdaclorid (0.005%) followed by acetamiprid (0.004%), thiamethoxam (0.005%), fibrinol (0.01%) and dimethonate (0.03%) which gave 33.85, 33.01,32.90 and 32.58qha-1 seed yield respectively **(Pavan Kumar Choudhary*et.al.*, 2017).**

In a study done by **Lloyed T. Richardson (1957),** around nine insecticides and ten herbicides were applied in a sequence of dosages on barley plant to evaluate their effect and on the basis of growth of barley seedling and on the development of root rot infection different groups were created with following results.

Group A:-Schradan, isodrin, DCU, IPX and TCA were included in this category. They were not showing any effect on host and any impact on disease development.

Group B:-Lindane , dieldrin and DDT were placed in this group. The growth of barley seedlings was promoted when they were applied but there was no effect on disease development.

Group C:-Maliec hydrazide and heptachle belongs to group C. When these were applied, the seedling growth was stimulated, but there was an increase in the severity of infection.

Group D:- Seedling growth was not affected but there was a reduction in root rot infection these insecticides were applied. Aldrin, endrin, chlordane, NPA, 2, 4-D, monurea, DNBP and dalapon were placed in group D.

Organic and inorganic nutrients are important for increasing the crop yield and soil health. According to a study of **Faisal Mahmood *et.al.*,( 2017)**, organic and inorganic fertilizers applied on maize was showing a characteristic effect on physicochemical properties of soil. Sheep manure (SM), poultry manure (PM) and farmyard manure were used as organic nutrient source while different concentration of urea, di-ammonium phosphate (DAP) and sulphate of potash were applied as inorganic nutrient source. From the results, it was deduced that on application of fertilizer along with organic manures, the growth and productivity of maize were substantially improved whereas when inorganic fertilizers were used alone or in combination of organic manure, the total C, N, P, K content in soil was increased. With the increase in N, P and K, contents in soil the maize grain yield were also increased. So it was concluded that on incorporation of inorganic fertilizers with organic manures there is an increase in productivity.

Sorghum is the best fodder crop in many countries and used for feeding of the cattle. Due to its palatability and easy digestion it is more preferred than other kharif season fodder crops. To check out the effect of fertilizer on the fodder crop an experimental study was carried out in **Lovely Professional University, Phagwara**. Inorganic fertilizers like NPK and organic fertilizer like FYM, Flyash and vermicomposts were used. Seeds were sown and after 60 and 120 days, data was recorded. Different formulations of organic and inorganic fertilizers were used along with three replications. Plant height, leaves length and number of leaves, stem girth and plant population all these growth parameters were measured at 60 DAS and 120 DAS. When T8 was applied, growth characters of plant increased significantly with respect to control treatment **(Sunita Rani*et.al.*, 2018).**

For the evaluation of the effect of different organic (biochar and FYM) and inorganic amendments (urea) on the growth and phenology of wheat, experiment was conducted with three factors such as biochar at three levels (0.25 and 50 t $ha^{-1}$), FYM at two levels (5 and 10 t $ha^{-1}$)and N at two levels (60 and 120kg $ha^{-1}$). On incorporation of FYM and N booting, anthesis, milking and maturity were delayed in wheat as a result of this higher leaf area, plant height, tillers and spike $m^{-2}$ were seen as compared to control **(Kaswar Ali *et.al.*, 2015).**

## References

[1] Elena TodirascuCiornea, Gabriela Dumitru and Ion Sandu, The DNP and potassium idodate influence on hordeum vulgare seedlings viability, Can.J. plant. Sci. 1957, 37:196-204.
[2] A.Ghosh, A.Samanta and M.L.Chatterjee, Dinotefuran : A third generation neonicotinoid insecticide for management of rice brown planthopper, African journal of Agriculture research. 2014,9(8 ):750-754.
[3] SujayHurali, Vinoda, Ravi biradar, H Mahantashivayogayya, Pramesh D, and Gowder SB, Evaluation of new generation granular insecticides against measure lepidopteran pests of rice, International journal of chemical studies. 2020, 8(1): 1047-1051.
[4] Enas Ahmed Ali Jbreel, Effect of urea fertilizer on growth and oil content of lemon grass, 2016.
[5] Anjil Kumar and Ashok Kumar Singh, Effect of insecticide profenophos on germination , early growth and meiotic behavior and chlorophyll mutation of barley,2008.
[6] Rabindra N. Pandey, NabakishoreNayak and Shakti Rath, Antagonism and combined effect of chemical fertilizers and carbamate insecticides on the rice field $N_2$ –fixing cyanobacterium *cylindrospermum*sp. invitro, InterdiscipToxicol, 2014, 7(1):5-11.
[7] Pragyan Dubey, Amit Kumar Mishra, Pratiksha Shukla and Ashok Kumar Singh, Differential sensitivity of barley to chlorpyrifos and propiconazole: morphology, cytogenetic assay and photosynthetic pigment, Pesticide biochemistry and physiology, 2015.
[8] M .Meghraj, K. Venkateswarlu and A.S.Rao, Effect of carbofuran and carbaryl on the growth of a green alga and cyanobacteria isolated from a rice soil, Agriculture ecosystems and environment, 1989.
[9] S.Senthil Nathan, Paul Gene Chung and K. Murugan, Effect of botanical insecticides and bacterial toxins on the gut enzyme activity of rice leaf folder *cnaphalocrosismedinalis*, Phytoparasitica ,2004, 32(5):433-443.
[10] Nabil E.El–wakeil, Abdellah S.H Abdel Moniem, NawalGaafar, Christa Volkmar, Effectiveness of some insecticides on wheat blossom midges in winter wheat ,Gesundepflanzen, 2013,65:7-13.
[11] Asheeshchaurasiya, Durgesh Singh, Swaraj kumar Dutta, Shiv Bahadur and Santosh Kumar Dubey, Effect of synthetic compounds on performance of wheat under high temperature stress condition, International journal of current microbiology and applied sciences, 2018 ,7(5):-3543-3554.
[12] Pavan Kumar Choudhary, Suresh Jakhar and K.C. Kumawat, Evaluation of some insecticide and biopesticides for management of barley aphid *(Rhopalosiphummaidis)* , International journal of current microbiology and applied sciences, 2017, 6(8):1330-1338.
[13] Lloyed .T. Richardson, Effect of insecticides and herbicides applied to soil on the development of plant diseases, Can. J.Plant Sci.,1957, 37:196-204.
[14] Faisal Mahmood, Imran Khan, UmairAsharf, TanvirShazad, Sabir Hussain *et.al.*, Effect of organic and inorganic manures on maize and their residual

impact on soil physic-chemical properties, Journal of soil science and plant nutrition, 2017,17(1) 22-25.
[15] Sunita Rani, GeetaKandpal, Mansukh Singh Jatana and Gurwinder Singh, Effect of different fertilizers on growth parameters of Sorghum, International journal of current microbiology and applied sciences, 2018, 7(6):2086-2091.
[16] Kawsar Ali, Muhammad Arif, Shahen shah, Zahid Hussain, Asad Ali, Said Munir and Hassan Sher, Effect of organic and inorganic nutrient sources on phenology and growth of wheat , 2015,47(6):2215-2222.