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EFFECTS OF CONTINUOUS USE, EXCESSIVE AND/OR PROLONGED CARBARYL IN LABORATORY RATS CD (SD) BR

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SUMMARY

One of the main problems that agriculture has had to face are pests, which over time have diversified because of different climatic conditions or adaptation. To this end has been used for more than 100 years different pesticides for its elimination, which has resulted in an effective method but with consequences to human health. That is why in this work they are looking to develop a neural network with the ability to predict the risk of early form of consumption of carbaryl in human health, using as a basis for data records from more than 300 studies in laboratory rats type CD (SD) BR.

Keywords: neurotoxicity, carbaryl, rats CD (SD) BR, neural network.

1. INTRODUCTION

Agriculture as a fundamental process in the field of the survival of humanity, has undergone changes as time passes, with the purpose of increasing the production, reducing production times of harvest, and optimize the use of natural resources such as water and land. One of its most important changes is the use of pesticides as the mechanism for the prevention and elimination of pests and organisms harmful to crops. Unfortunately in the last 50 years have carried out studies of the consequences that this entails for the human health, which goes from allergies or sintomatologías mild to cancer, coma or even death [1] [2].

As a solution to this problem have been carried out different studies with the purpose of classifying the risks that occur, and the maximum permitted doses for each of the pesticides. Additionally we have studied the effects that occur while minimizing the use of the most dangerous. [3] In the case of compound carbaryl, which is commonly used in a wide variety of pesticides, the opposite happens, where despite its risk to health is used is the great variety of food from the basic diet. [4] And [5]

By the foregoing in recent years have been carried out different studies to determine if it is really safe to use it or not, as shown in [6] A study was carried out in natural water sources with the purpose of determining the presence of carbaryl, by means of a technology-based inmunosensor of surface plasmon resonance (SPR). The results obtained showed the presence of low concentrations of this compound demonstrating the degree of permanence that has to be used on different crops.

On the other hand [7] It was studied the relationship that exists between the urinary metabolites of Carbaryl with the quality of the semen human, where was evidence a strong association between the 1-naphthol (metabolite of Carbaryl) and concentration, mobility and speed of semen and a lower association with the morphology of this, where it was possible to establish the degree of affectation of this compound in the male reproductive system human.

In [8] A study was conducted on the ability of the compound to stimulate the receiver of hydrocarbon arilio affecting directly theDna in various animals such as mice, rats, pigs, and even rights. Similarly in [9] It was investigated as these same animals metabolize the compound, taking into account the metabolites that are produced and that effects have on the different agencies -- In [10] A study was carried out on the different conditions in several species where it was determined that under conditions of stress as the presence of a natural predator, the carbaryl is 2 to 4 times more lethal and requires a much smaller dosage to generate critical effects on the animal.

Due to the wide variety of effects that the carbaryl produces on the agency in mammals and in general in almost every type of animal being studied, one of the more efficient mechanisms to develop a prediction algorithm are the neural networks, which as shown in [11], [12] And [13] Shows the potential they have to determine from patterns, symptoms and possible damages to the health according to different databases as shown in [14].One of the examples shown in [15], where it identifies breast cancer by means of this technique, using as a source of information and a data base of Wisconsin with more than 699 records of breast cancer. Of all the work carried out is intended to use the neural networks for pattern recognition and the detection of possible effects of the compound carbaryl frequently used in various pesticides, for which they have collected different studies in rats CD (SD) BR laboratory, exposed to different conditions and different doses of the compound.

2. METHODOLOGY

The carbaryl (C) belonging to the family of carbamates is a chemical compound used commonly in various pesticides, is commonly produced from treatment of the isocyanate bromide (A) with 1-naphthol (B) as shown in Figure-1. [16]

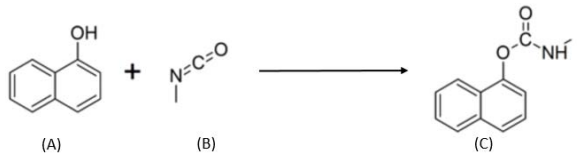

Figure-1. Molecular structure of carbaryl.

This pesticide is catalogd as risk II by the EPA and is used as an insecticide and nematicide in various crops. Additionally is found in the list of bad actors of bread (Pesticide Database) due to be cholinesterase inhibitor, which granted a series of restrictions as are not to be applied on aerial fumigation, leave a time of isolation of 12 hours in the fields fumigated, among others. In the Colombian case is catalogd as risk III even to be used in all crops shown in Table-1. [17]

Table-1. Different uses of carbaryl.

Pesticide **Technical name**	**Pest and Crop/s**
Carbaryl (carbari)	Avocado: borer fruit (*Stenomema* sp.), pin of the seed and the fruit (*Stenoma* sp., *Heilipus sp.*)
	Banana and plantain: the fruit (*ColaseisMorrocoyita* sp.) & mapaitero or bee angelita or bee short hair (*Trigona* spp.), worm screw
	Onions: Choppers and tierreros *(Agrotis sp., Peridroma sp.)*
	Beans: soil pests worm of the grains (*Delia* sp.) Slugs (*Milax* sp, *Deroceras* sp.), Tierreros, choppers (*Agrotis* sp., *Spodoptera* sp.), or mojojoyChiza (*Ancognata* sp. *And Phyllophaga* sp.), Cucarrones canteens of sheet: *(Naopactus* sp, *Diabrotica* sp. *Cerotoma* sp.) worms defoliants (*Pseudoplusia* sp.) Whitefly (*Trialeurodes* sp.), Pest of the pods, pin of the pods (*Laspeyresia* sp.) fall armyworm, pod perorador (*Epinotia* sp.)
	Handle: Trips (*Selenothrips* sp.), drill the handle (*Hypocryphalus* sp.), Fruit Fly (*Ceratitis sp.* And *Anastrephaspp*.)
	Peas: Trips, worm of the sheets (*Heliothis* sp.)
	Tomato: Worm cachón (*Manduca* sp.)
	PAPAYA: Worm cahudo (*Erinnys* spp.)
	Castor: foliageCucarroncitos (*Diabrotica* spp., *Cerotoma* spp.)
	Cucumber: Tierreros (*Agrotis* sp., *Grillotalpa* sp.)
	Pineapple: screwworm from the pineapple (*Thecla* sp.)
	Corn: Tierreros and choppers: (*Spodoptera* sp., *Agrotis* sp., *Solenopsis* sp. *Euetheola* sp., *Blisus* sp.)
	Broccoli: Gallina ciega (*Phyllophaga* spp.), Wormwire (*Aeolus* spp), Tortuguilla (*Diabrotica* spp.), Worm Nochero (*Agrotis* spp), Wormsoldier (*Spodoptera* sp.), False gauge *(Trichoplusia* sp.), Afidos oraphids (*Aphis* spp., *Brevicoryne* sp.)
	BREVO: Trips or bugs Candela (species without identifying)
	Beet: Slugs (*Deroceras* sp, *Limax* sp, *Milax* sp.), Tierreros, Worm of Wire, Worm Gray (*Agrotis* sp.), Worm Green (*Phytometra* sp., *Laphygma* sp.), Cassida (*Cassida* sp.), Cleonus (Cleonus sp.)
	Sorghum: Fly the ovary, complex: (*Contarinia* sp. + *Pococera* sp., *Dichomeris* sp., *Pleuroprucha sp., Celama* sp., *Sathrobrota* sp.*).*
	Coffee: Chizas - Mojojoy , Slugs
	Stevia: Ant arriera, cutter ant (*Atta* spp.)
	COCO, forestry, PASSION FRUIT: Insect control

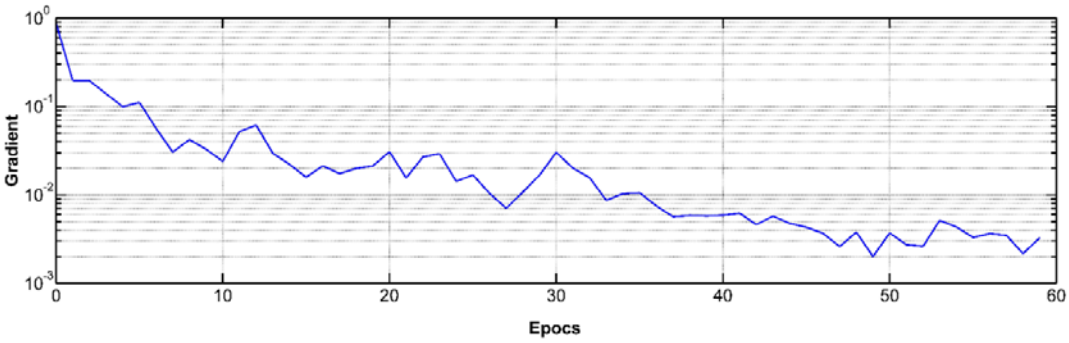

Figure-2. Gradient of the network throughout the training.

In both cases (USA, Colombia) the pesticide is Approved and sold commercially, even for Colombia in the most recent record of sale of pesticides for agricultural uses shown in [18] Its latest update of registration data of 22/02/98, despite the fact that in the case of the EPA has frequently updated its use and care until 28/02/11 including a control plan and risk of this compound as shown in XX.

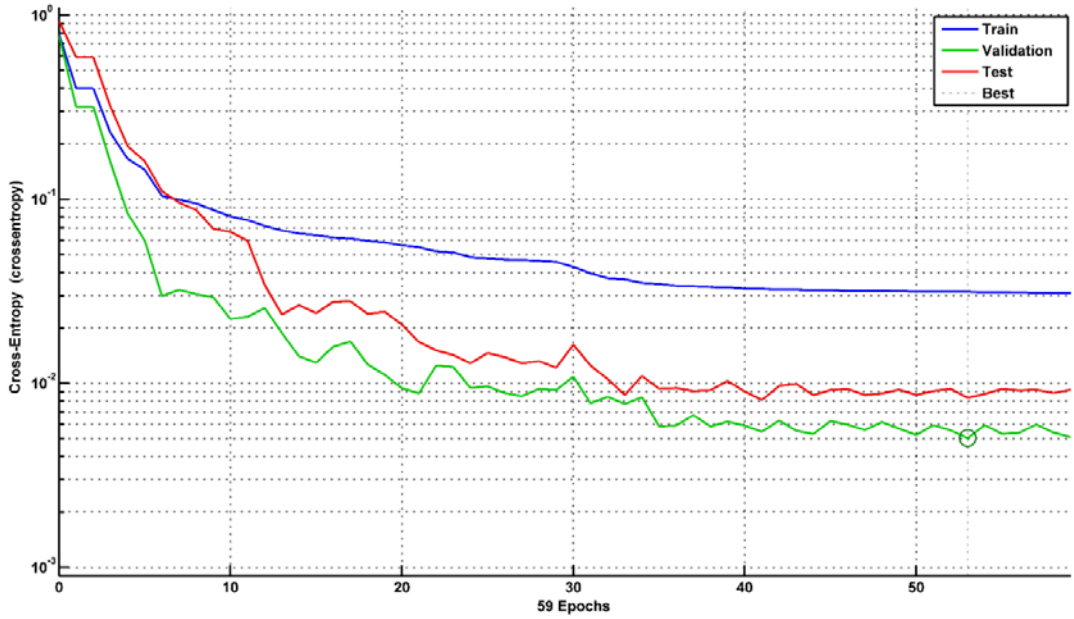

Figure-3. Entropy crusade in the construction of the network.

On the other hand with the purpose of performing the recognition of patterns are developed a neural network using for its creation a compilation of studies of the EPA taken from XX on toxicology in living beings showing the different effects and effects that chemical compounds produced in the different agencies, as a basis for information, the EPA used studies of the past 50 years carried out by different organizations, universities and experts around the world.

In regard to the neural network, this was developed in 3 stages, for the first I rate the information collected in two groups: input data and output data. In the first group was included, the dose, the purity of the compound, the method of administration of the dose which was by way of feed or by forced intubation, the duration of the study and the number, sex, the initial build and end of animals studied. In the second group is the resulting effect and the organs or systems affected.

In regard to the algorithms used in the development of the network, was used for training the conjugate gradient scaling, for hidden layers are used the hyperbolic tangent sigmoid and the role of soft maximum transfer in order to optimize the selection of the data and the speed at the time of the training network.

3. RESULTS

As a first step were carried out different tests using both the data from the studies collected, as data from other studies. In the first group of tests were carried out in Matlab, where collected data were grouped in three classes, more specifically training, validation and testing. Because of that for the output data is found more than 32

effects along more than 300 studies, it was necessary to a reclassification of these, due to that with the raw data is presented a degree of confusion over 50 per cent including an effectiveness below 30 per cent.

Once recategorizaron the effects produced and carried out training was achieved a network with 0 per cent of confusion for eight inputs and six outputs, with 26 neurons in the hidden layer and with the best performance and gradient of over 200 trainings made. Figure-2 shows the training carried out for the first group of tests.

As you can see in Figure-2 the gradient decreases progressively as the times increase was obtained a gradient of 0.00327 departing from 0.882, achieving the 80 per cent of the estimated target. Additionally you can see that the gradient has decreased significantly in the first 25 times, demonstrating the speed of optimization of the algorithm used for a training with more than 1000 times. In Figure-3 shows all the stages used in the development of the network.

As a final test Matlab performs cross entropy between the three phases of training of the network, with the purpose to determine the lesser degree of error in the validation of the network over the 1000 times, this may show in Figure-3, that that point was obtained at the 59 times with a yield of 0.031, which is generally in managed to get a more than 50% of the proposed goal.

Once developed the network was proceeded to carry out the final test on data from other studies, to do this by using Excel and the network already created is proceeded manually to enter the data to the network and plotting the response obtained this result can be seen in Figure-4.

4. CONCLUSIONS

In general terms the neural network developed presents a good behavior for the prediction of harmful effects due to the consumption of Diclorvos, where it was demonstrated that this compound has different reactions in the body, depending on the metabolism, age, sex and absorption of the body tested. Apart from this it was observed that this compound has a high rate of affect the enzyme cholinesterase at low concentrations, and when using a chemical as these which is cataloged toxicity 1 in foods such as fruits and vegetables common, affects so much on the health of human beings.

To see the databases it was found that the majority of studies were applied under normal conditions, where it was to this from fetuses and studying its growth to adult life, for the case of Diclorvos, was submitted that more than 50 per cent of the studies and of the most important effects, were found in mice of adult ages, due to the fact that the studies in young presented random effects and in the case of the fetuses was not found any effect.

By grouping the effects according to its origin, cause, system or effect, the network was able to better understand the data taken by reducing the number of outlets for multiple entries, which as explained earlier, because the effect of a compound depends in a great part of the body that swallows, generates that for a number of more than 128 studies in more than 25 animals per study, the compartments are almost random, and is thus that occur up to 16 different effects in mice studied.

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