IMPACT OF SEASONAL VARIATION ON POPULATION OF WEEVILS (Neochetina Spp).

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ABSTRACT

The impact of seasonal variation on population of weevils (Neochetina Spp), commonly used as water-hyacinth bio-control agent was carried out in the National Institute for Freshwater Fisheries Research water-hyacinth insect laboratory. The experiment was conducted between May 2006 and April, 2007. Ten plastic containers of 50 cm depth, 60 cm diameter and 20-litre capacity each filled with 16- litters of water and 20 bunches of water hyacinth were used for the experiment. Ten weevils made up of five male and five female were introduced into each of the plastics container. The weevils were monitored daily, their numbers recorded. The result showed that, during wet season (May to October) the population of weevils increased, while it decreased during the dry season (November to April). Data analysis showed that, there was significant difference between wet season and dry season. ($P<0.05$).

INTRODUCTION

Members of the genus Neochetina are native to South and Central America. All members of this family are semi-aquatic, spending much of their time on or in aquatic plants of the family Pontedariaceae (upon which they feed exclusively) (Sankaran, 1976). Surveys conducted in South America in the 1960s identified organisms that feed on waterhyacinth in its native range. Three agents were identified, including the two weevil species in the genus Neochetina and the moth *Sameodes albiguttalis*. The chevroned waterhyacinth weevil was introduced in Florida in 1974, and individuals were released in Alabama, California, Louisiana, and Texas in the following year. Currently, the chevroned waterhyacinth weevil is distributed throughout most of the U.S. range of water-hyacinth (Singh *et al*, 1967).

Adults of the chevroned waterhyacinth weevil are similar in appearance to the mottled waterhyacinth weevil. They can be distinguished from the mottled waterhyacinth weevil by the colour and pattern of scales on the wing covers (the elytra). For example, the chevroned waterhyacinth weevil is usually gray to brown with a distinct lighter brown to tan chevron (crescent-shaped marking) on the wing covers. Although the chevron can be distinctly present in many individuals, it is absent in others. Therefore, the dark raised lines present on the elytra are used mainly to separate the species. In the chevroned waterhyacinth weevil the lines are smaller in length and located behind the midline of the wing covers (Smith, 1978).

Another subtle character is the nature of the shallow grooves or striae running the length of the elytra; for the mottled waterhyacinth weevil the striae are relatively "coarse" as opposed to the "fine" striae present on the chevroned waterhyacinth weevil.

During the reproductive cycle eggs are deposited directly within the tissue of the waterhyacinth plant. Adult female weevils bore a hole in the lamina or petiole of the leaf and deposit a single egg. Eggs may also be deposited around the edges of adult feeding scars. It has been reported that chevroned waterhyacinth weevils prefer to lay eggs in the tender central leaves or ligules surrounding the leaf bases. Eggs hatch within 7-10 days at 75 °F. A single female chevroned waterhyacinth weevil may oviposit >400 eggs during her lifetime. Over 90% of the eggs are deposited within a single month period (Hicklimg, 1987).

The Larvae are essentially "worm-like," bearing no legs or prolegs and only small enlargements with setae (small hairs) where legs would normally be found. The larvae are usually white or cream-colored with a yellow-orange head. The posterior end of the body is relatively nonspecialized and blunt with a pair of dorsally projecting spiracles that the insect is thought to insert into the plant tissues to extract oxygen. First instar larvae are very small (2 mm in length); mature (third instar) larvae are "grub-like," C-shaped, and 8-9 mm in length (Swingle and Smith 1980). They are virtually indistinguishable (except by experts) from those of the mottled waterhyacinth weevil. The chevroned waterhyacinth weevil larvae are typically found feeding within the bases of leaves and petioles, entering the apex of the stem when mature, where they destroy the apical bud.

Pupae of the chevroned waterhyacinth weevil are creamy white and are enclosed within a cocoon that is formed among the lateral rootlets below the water surface. Pupae within their case have the appearance of small "balls" about 5 mm in diameter typically on roots near the stem. Like the larvae, pupae of the chevroned waterhyacinth weevil are virtually indistinguishable (except by experts) from those of the mottled waterhyacinth weevil (Padan *et al*, 1978).

The adult and larval weevils feeding on waterhyacinth may drastically affect the appearance of the plant, the destruction of individual plants and/or overall impact of a population of waterhyacinth plants is not so straightforward. A combination of high populations of adult and larval weevils can, over a period of time, lead to stunted growth, hardening of the plant cuticle, and leaf curling due to girdling of the leaf and interruption of the flow of plant nutrients and water (Charlie, 1980).

Another noticeable feature is the encroachment of other plant species into the waterhyacinth mat. This occurs because meristematic tissues (i.e., new leaves and daughter plants) are destroyed, resulting in less overall productivity and growth, permitting slower growing native plants to begin outcompeting waterhyacinth in the general area. (Alfred, 2003). The menace of water hyacinth which includes; interference with fish population, fishing activities, limiting available fish food to mention but a few are well known. Therefore, study of this nature is necessary to find out the condition favorable for the insects population.

THE STUDY AREA

The study area was National Institute for Freshwater Fisheries Research (NIFFR) water-hyacinth insect laboratory located (9° 5.5 N) in the Northern Guinea Savanna Zone of Nigeria. The climate is tropical with a distinct rainy season (April October) and a dry season (November March). The mean annual rainfall is 110 mm evenly distributed through the 180 days of the rainy season.

MATERIALS AND METHOD

The experiment was conducted on monthly basis between 1st May, 2005 and 31st April, 2006. Ten plastic containers measured 50cm, depth, and 60cm diameter, with 16 litters of water and 20 bunches of water hyacinth was used for the experiment, Ten weevils were stocked in each of the plastics container five male and five female. The weevils were monitored daily, the number counted and recorded.**RESULT.**

The increase in number of weevils per plastic was recorded monthly. The average numbers of the insect population were also recorded. The result further -explained how temperature, rainfall, relative humity affected the reproduction potentials of weevils. The details of the result are tabulated below:

Table: 1 Performance of Weevils introduced into Plastic receptacles for waterhyacinth control.

PLASTIC Nos.	1	2	3	4	5	6	7	8	9	TOTA L	MEAN
WEEVILS/PLASTIC	5	5	5	5	5	5	5	5	5		
MONTH											
MAY/2006	20	21	18	12	11	13	16	15	12	136	15.11
JUNE	21	13	17	20	15	16	12	15	17	146	16.22
JULY	20	25	26	21	15	16	14	12	14	163	18.11
AUGUST	22	35	30	35	23	22	22	23	20	232	25.78
SEPTEMBER	25	35	40	35	40	40	40	23	10	288	32
OCTOBER	23	35	20	26	25	20	30	35	38	252	28
NOVEMBER	13	14	15	16	17	18	19	20	21	153	17
DECEMBER	10	11	10	11	6	9	10	8	9	84	9.33
JANUARY/2007	8	7	10	7	9	9	10	5	7	72	8
FEBRUARY	5	8	7	5	5	8	5	5	8	56	6.22
MARCH	2	5	6	4	7	4	5	4	5	42	4.66
APRIL	9	10	9	9	7	10	5	6	8	73	8.11

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DISCUSSSION

The multiplication rate of the weevils was high between the month of May and October. This also coincides with the period of high rainfall, low temperature and moderate relative humidity in this part of the country. The decline in weevil multiplication rate started after October, 2006 and continued up to the period the experiment was terminated in April, 2007. This is because at that time the relative humidity was very low with high atmospheric temperature ranges between 38°C to 40°C and moderate to low rainfall. The same observation was made by Padan *et al*, (1978). The population of weevils is seriously affected by temperature, rainfall and relative humidity. Generally, when the temperature is low coupled with period of rainfall, the populations of weevils tend to increase.

This result is in agreement with Charles, 2003.which says that, the higher the temperature the lower the rate of production of the weevils. And further clarify that

when temperature was higher the weevils eggs cannot be hatch and eventually if the temperature continue to rise excessively the adult ones may stop producing eggs. Studies by Singh, *et al*, 1980 showed that when introduced into water hyacinth under high relative humidity, the weevils' populations doubled.

The data was subjected to Analysis of Variance (ANOVA) and the results showed that there is no significant difference in weevils' population between the plastics infested in the same month. In the month of December, January, February and March there was drastic drop in their reproduction potential which might be due to high temperature and low humidity. However, there are significant differences between the month of December, February, March and May. And, also between rainy and dry season. ($P<0.05$).

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