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RESEARCH ARTICLE

DIVERSITY OF WEEDS AND HERBICIDES IN SHALLOW RICE GRWING IN DALOA

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Abstract

Rice farming in the Côte d'Ivoire faces enormous constraints, including that of adventitious management. A study on rice adventitious was conducted with the objective of inventorying rice adventitious as well as herbicides that are used for chemical control in the city of Daloa. Thus, 60 rice growers selected at random and from three (3) bunds representing plots of approximately four (4) meters were randomly selected. In each plot, all the weeds met were identified as well as the herbicides used by the rice growers. Floristic surveys have identified 34 species divided between 30 genera and 15 families. The most represented families are the Poaceae, Cyperaceae, Asteraceae, Euphorbiaceaes and Amaranthaceae. A total of 14 herbicides have been identified and their choice by the rice grower is essentially guided by the experience of rice growers on their effectiveness. We have counted as for the herbicides used, 2,4-D amine salt and glyphosate because of their large spectrum of action on weeds.

Introduction:-

Rice is one of the most popular cereals in the world diet (Fall & Dieye, 2008) but unfortunately its production faces the huge problem of adventitious management in crops. In fact adventitious compete with crops for nutrients, space and light and provide shelter from pests and diseases such as the rice disease pathogen called "la panachurejaune du riz" or Rice Yellow Mottle Virus (RYMV) (Sarra *et al*., 2004). To solve the problem of adventitious, herbicides are used in the context of chemical control. It is one method among many that summons less labor, which is very scarce. The use of herbicides has become so common and systematic that there is a proliferation of commercial products giving rise to choices. In order to contribute to a better management of adventitious in rice growing, we have found that it is necessary and important to guide the rice grower in the choice of herbicide and this choice requires knowledge of the adventitious flora. Thus, our current investigation is being carried out to identify the adventitious of rice farming on the one hand and on the other hand to inventory the herbicides used in the context of chemical control through the theme: Diversity of weeds in the rice farming and herbicide inventories in Batta (Daloa, Côte d'Ivoire).

Material and Methods:-

Study Environment:

The study was conducted in the town of Daloa in the center-west of Côte d'Ivoire and capital of the Haut Sassandra region. The Department of Daloa is located between 6°40 'and 7°20' North latitude; 6°00 'and 6°40' west longitude

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and at 256 m altitude and covers an area of 15,200 km² for an estimated population of 1,430,960 inhabitants (RGPH, 2014).

Methodology:-

An inventory of rice adventitious in the town of Daloa was carried out during a cropping cycle using the site survey method associated with the plot method on 60 plots. In each plot, three (3) squares (approximately 4 meters) delimited by bunds and representing plots were chosen at random. In these plots, all the weeds encountered were systematically counted, sampled and identified.

The absolute, relative frequencies and the specific contribution of each adventitious species were calculated from the expressions below in order to classify them according to their importance in the environment and their level of aggressiveness. The relative frequency is calculated as follows: Fr = Fa * 100 / NR with Fr: the relative frequency, Fa: the absolute frequency which corresponds to the number of times that a given species has been encountered during the plot surveys and NR: the total number of readings carried out The specific contribution (Cs) due to the frequency is obtained according to the ratio:

$Cs = (Fa / \Sigma n1Fa) * 100$

It reflects the importance of the species and can be interpreted in the following ways according to Daget et al (1982): If Cs is less than 1%: the weeds are not very aggressive; $1 \leq Cs \leq 4$: the weeds are aggressive and if Cs is greater at 4 then the adventitious are said to be very aggressive. The specific diversity index (Ids) was taken into account to understand the mode of distribution of adventitious in the field calculated according to the expression: Ids = NE / NGo where NE is the number of species and NG the number of genera identified.

As for the herbicides used in chemical control, a survey was carried out among rice growers in order to identify the herbicides, their active ingredients, their formulations and their doses.

Results and Discussion:-

Diversity of rice adventitious:

The investigations permit to identify 34 species of weeds belonging to 30 genera and 15 families and two classes which are the Monocotyledons with a representativeness rate of 50% and the Dicotyledons also representing 50% of the weeds. The most represented families are the Poaceae with 26.37%, the Cyperaceae with 14.70%, the Asteraceae with 14.70%, the Euphorbiaceae with 8.82% and the Amaranthaceae with 5.71% (Table I).

The specific diversity index, which is 1.13, is relatively low and shows good homogeneity in the distribution of adventitous in the field. The values of the Specific Contribution of each species allow the adventitious of rice to be grouped into three (3) classes as shown in Table I. The class of major weeds, represented by a procession of 12 species of weeds is led by Alternantherasessilis accompanied by Echinochleacolona, Leptochloachinensis and Sacciolepis Africana which are very remarkable in the field. The class of minor adventitious is made up with 13 species led by Bidenspilosa and Cyperusesculentus which are species with strong reproductive power. The class of occasional adventitious is represented by border species in general as we have observed in the field.

Table I:- Floristic list of weeds inventoried in rice plots followed by their relative frequencies (Fr), their specific contributions (Cs) and their aggressiveness.

N°	Species names	Family	Groups	Fr. (%)	Cs. (%)	Weedaggressivenes s
1	*Alternantherasessilis*	Amaranthaceae	Dicotylédone	50	8,58	Classe I: major Adventitious 35,29%
2	*Commelinaforskalaei*	Commelinaceae	Monocotylédone	50	8,58	
3	*Echinochleacolona*	Poaceae	Monocotylédone	50	8,58	
4	*Aristidaadscensionis*	Poaceae	Monocotylédone	47,05	8,52	
5	*Cyperusdifformis*	Cyperaceae	Monocotylédone	47,05	8,52	
6	*Leptochloachinensis*	Poaceae	Monocotylédone	44,11	7,57	
7	*Sacciolepis Africana*	Poaceae	Monocotylédone	44,11	7,57	
8	*Fimbristylislittoralis*	Cyperaceae	Monocotylédone	35,29	6,06	
9	*Heterantheracallifolia*	Pontederiaceae	Monocotylédone	35,29	6,06	
10	*Eleusineindica*	Poaceae	Monocotylédone	29,41	5,05	

11	*Ludwigiaabyssinica*	Onagraceae	Dicotylédone	29,41	5,05	
12	*Echinochlea crus galli*	Poaceae	Monocotylédone	26,47	4,54	
13	*Bidenspilosa*	Asteraceae	Dicotylédone	20,58	3,53	Classe II: Minor Adventitious 38,24%
14	*Cyperusesculentus*	Cyperaceae	Monocotylédone	17,64	3,03	
15	*Cleome viscosa*	Capparidaceae	Dicotylédone	14,7	2,52	
16	*Lindernianummulariifolia*	Scrophulariaceae	Dicotylédone	14,7	2,52	
17	*Phyllanthusamarus*	Euphorbiaceae	Dicotylédone	14,7	2,52	
18	*Diplachnéfusca*	Poaceae	Monocotylédone	11,76	2,02	
19	*Kyllingsquamulata*	Cyperaceae	Monocotylédone	11,76	2,02	
20	*Oryzasp*	Poaceae	Monocotylédone	11,76	2,02	
21	*Sphenocleazeylanica*	Sphenocleaceae	Dicotylédone	11,76	2,02	
22	*Nymphéa alba*	Nymphaeaceae	Dicotylédone	8,82	1,51	
23	*Bacopadecumbens*	Asteraceae	Dicotylédone	5,88	1,01	
24	*Euphorbia hyssopifolia*	Euphorbiaceae	Dicotylédone	5,88	1,01	
25	*Ipomeasp*	Convolvulaceae	Dicotylédone	5,88	1,01	
26	*Ageratum conyzoides*	Asteraceae	Dicotylédone	2,94	0,5	Classe III: occasional adventitious 26,47%
27	*amaranthusspinosus*	Amaranthaceae	Dicotylédone	2,94	0,5	
28	*Brachiariadeflexa*	Poaceae	Monocotylédone	2,94	0,5	
29	*Cassia obtusifolia*	Caesalpiniaceae	Dicotylédone	2,94	0,5	
30	*Chromolaenaodorata*	Asteraceae	Dicotylédone	2,94	0,5	
31	*Cyperusrotundus*	Cyperaceae	Monocotylédone	2,94	0,5	
32	*Euphorbia hirta*	Euphorbiaceae	Monocotylédone	2,94	0,5	
33	*Marsilieaminuta*	Marsileaceae	Dicotylédone	2,94	0,5	
34	*Vernoniagalamensis*	Asteraceae	Dicotylédone	2,94	0,5	

Diversity of inventoried herbicides:

Investigations revealed fourteen (14) herbicide products with different trade names and are mostly in liquid form with different dosages. The characteristics of each product are given in Table II. We observe a great use of certain products like Herbextra, Gramextra, Ladaba, Herbo super, Bibana, Titan and Tout burned whose frequencies of use are higher or equal to 10%.

These 14 herbicide products actually represent seven (7) different active ingredients and the most widely applied are 2,4-D amine salt (selective, post-emergent), Glyphosate (total, collected), Cyhalofop-butyl (selective, post-emergent) , Pyrazosulfuron-ethyl (selective, post-emergent) and metsulfuron-methyl (selective, post-emergent)

Table II:- Herbicides used for chemical control in Batta.

Trade names	**Active products**	**Doses**	**Use Frequency**
Herbextra	2,4-D seld'amine	720 g/l	56,66
Gramextra	Cyhalofop-butyl	150 g/l	33,33
Ladaba	Glyphosate	360 g/l	20
Herbo super	Pyrazosulfuron-ethyl et metsulfuron-methyl	107 g/l	16,66
Bibana	Glyphosate	360 g/l	13,33
Titan	Metsulfuronmethyl	200 g/kg	13,33
Tout Brulé	Glyphosate d'isopropylamine	410 g/l	10
Garil	Triclopyr (72g/l) et Propanil	360 g/l	6,66
Malogbè	Metsulfuron-methyl	200 g/l	6,66
Rangro	Glyphosate	757 g/kg	6,66
Rapid max	Glyphosate	480 g/l	6,66
Tako-clé	Glyphosate	360 g/l	6,66
Gryphader	Glyphosate	360 g/l	3,33
Herbigro	2,4-D sel d'amine	720 g/l	3,33

Discussion:-

The flora of the weeds identified is made up of 34 species, 30 genera and 15 families against 148 species, 102 distributed genera and 40 families counted by Sylla (2017) in his work carried out in the peri-urban areas of Daloa. The difference can be explained by the fact that our site is smaller than Sylla's. However, the most important families that this author had indicated are the same ones that our work indexes: the Poaceae, the Asteraceae, the Cyperaceae and the Euphorbiaceae. The comparison of the two floristic lists allows us to identify Alternanterasessilis and vernoniagalamensis for the first time in the present study. Their appearance could be explained by a selection of adventitious due to the spreading of herbicide products during farming cycles with always the same previous crop: rice. The five families most represented on the study site are among the ten families whose species are the most dangerous in the world with the dominant family the Poaceae (Kouamé, 2014; Kouassi, 2018).

For the management of this adventitious flora of shallow rice growing in Daloa, we note the use of 14 different herbicide products which really represent seven active ingredients including glyphosate and the 2,4-D amine salt are the most used. The glyphosate-based herbicides are total and are generally used pre-emergence or for the removal of plant biomass during plot preparation, while those based on 2,4-D amine salt are selective and used post-emergence. However, it should be noted that, for the rice grower, the choice of herbicide does not depend on the active ingredient. In fact, it has been observed that the herbicides Herbextra and Herbigro, which contain the same active ingredient at the same concentration, do not have the same frequencies of use. This is also the case for Ladaba and Glyphoder which have glyphosate in common as an active ingredient at 360g / l. Contrasting with this observation the level of study of most rice growers, we can understand that the choice of herbicide is based on personal experience or on other rice growers in relation to the effectiveness of a given herbicide as Kouassi noted. (2019) in Zuénoula.

It is important and it is now a necessity vis-à-vis environmental protection that farmers are trained on the composition and use of herbicides. This support, which is also a form of supervision of the rice-growing world, must be taken into account both by the authorities responsible for the rice sector and by the phytosanitary firms. Efficacy tests of the herbicides met must be carried out in the field on adventitious to affirm the effectiveness of these products in order to better guide the choice of the rice grower.

Conclusion:-

The study of floristic diversity reveals 34 inventoried species distributed equally between monocots and dicots. However, the poaceae remain the most abundant. The determination of the contribution due to the absolute frequency of the adventitious flora shows 12 species as being the most aggressive. In the context of chemical control, 14 herbicide products are used. The 2,4-D amine salts and glyphosate are the most common active ingredients for their efficacy on a wide range of adventitious. The high frequency of use of some herbicide products compared to others and the level of education of rice growers show that rice growers need to be trained on the nature, the use and the effectiveness of the herbicide met.

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