# Toxicity leaves of *Eucalyptus camaldulensis* and *Orium oleonder* on *Gambusia affinis* in water's Aïn Chkef river of Morocco

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Abstract— This article deals with the comparative analysis of the toxic effect of both studied species and vegetable shows that the leaves of Oleonder (*Orium oleonder*) are very toxic compared to those of Eucalyptus (*Eucalyptus camaldulensis*). The dried leaves of Oleonder desoxygenent much the receiver medium than Eucalyptus. Aching time proves a limiting factor in the mortality of Gambisia (*Gambusia affinis*). The mortality rates of Gambisia is growing as and as leaching time increases and Lessivas 24 hours of Oleonder leaves appear very toxic they are 15 times and more toxic than those obtained after one hour while for Eucalyptus those values TL 50 decreases. The toxicity of *Eucalyptus* leaves and Oleonder could be due to their content of polyphenols and soluble toxic substances.

Index termes— *Eucalyptus camaldulensis*, *Gambusia affinis*, leaching. *Orium oleonder*, toxicity.

## I. INTRODUCTION

It is known that the leaching litters release [23] their water-soluble substances within the first few days of immersion in water. Swept away by running water these substances can accumulate in stagnant environments ponds and ponds or renewal of the water is too low up to tint the water-soluble substance of this water. Some act on living organisms change their behavior and very often causing their death.

The contribution of leafy litters can thus alter the physico-chemical and biological quality of the receiver environment sometimes even cause a natural contamination of lakes ponds and small streams. The leaves of poplar eg bridge was recognized harmful particularly overlooked the fish populations of aquatic environments [29], this study on fishponds is very conclusive. The author observed a significant drop in primary and secondary productivities of basins with hardwood receipts contributions.

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The leaves of poplar [29] and needles coniferous [11] were recognized as harmful overlooked the vertebrate and invertebrate fauna of fish ponds. This is linked to the harmfulness leachates responsible leaves toxic effects rapid and direct enzymatic origin: deoxygenation of the water by the enzymatic complex polyphenolic -Peroxygenation- using as substrate the main polyphenolic compounds released by leaching leaves and/or ecotoxicological effect of water-soluble active ingredients such as saponins the terpenes tannins and intermediate quinones polycondensation melanin ceded by dead leaves and needles [11], [6], [18], [27], [24], [21].

By studying the effect of black poplar leaf leachate on fish *Rhodeus amarus* noted a toxic action leading to the death of the animal by asphyxia [27]. Candte linked to the almost total disappearance of the oxygen dissolved in water was caused by the formation of polycondensates Photomechanical blackish-brown color (has by enzymatic activity of peroxidase and polyphenoloxidase systems still present in senescent leaves after their hush) in aqueous maceras black poplar leaves.

In a report [16] from laboratory experiments that mass mortalities of eel elvers described in the fishery of Marost has Moulouya estuary in Morocco oriental could be due in part has the toxic action of polyphenols and other toxic organic compounds released into the water by the leaves of Oleonder next to the stabling cages student Anguilla's. En and comparing the toxic effects of five vegandable species (*Taxus baccata, Populus nigra, Salix babyloncian Acer and Platanus acerifolia monospessulanum*) *Gambusia affinis* and on *Artemia salina* [4] clearly demonstrated the toxicity of leachates leaves and their direct scavenger effect.

In Morocco the dry mass of leaves of *Eucalyptus camaldulensis* made to rivers is estimated at 500g/$m^2$/year [2] which is considerable in comparison with other regions of the word. In Australia for example *Eucalyptus forests* produce 610g/m²/year [12]. In Spain, *Eucalyptus globulus* produces 477g/m²/year while, in Portugal its production is only 204g /m²/year.

The Oleonder (*Nerium oleonder*) indigenous species in the Mediterranean regions is common in Moroccan river beds. Its evergreen leaves fall in late winter and early spring. The study of the impact of *Nerium oleonder* on the supply of organic matter in aquatic system vegetable showed that its annual contribution to the earth's litter in the high Zeghzel (Eastern Morocco) was evaluated in 139g/m² with 51g/ paper and 88g/m² fruit [14]. These contributions Plant immigrants are of great importance in the functioning of aquatic ecosystems Moroccan. Their leafy litter represents a major source of organic matter in forest soils and streams it is an important functional component of the aquatic ecosystem.

Their degradation represents major functional characteristics of Moroccan aquatic ecosystems [7], [14], [19]; it is the main process for the dissipation of energy and the release in the systems of stored nutrients coarse organic matter [7].

It allows among other things regular partly the accumulation of native and non-native vegetable organic matter into the bottom and therefore influences the sedimentation and recycling nutriments. Par addition some authors [10] [16] [3] have shown that the leaves fall dead in a few Moroccan aquatic ecosystems causes serious hydrobiological disturbance. These result in deoxygenation of the medium and therefore the suffocation of aquatic organisms. We intend to study the influence of these two sheands of species on the aquatic environment. For that we studed the impact of leachates of both types of leaves on the survival of a small fish *Gambusia affinis* main vertebra of rivers study. The toxicity tests used to detect the presence of toxic elements in water by the study of mortality changes in growth or biological behavior test species.

## II. MATERIAL AND MANDHODS

### 2.1. Choice and harvesting of leaves and test organisms

We chose as a foliar material leaves species *Eucalyptus camaldulensis* and *Nerium oleonder*. The dead leaves were harvested along the Ain Chkef waterways. These newly fallen were collected on the ground in the months of October and November. The harvest was made outside of rainy periods to exclude any possibility of natural leaching. A prior sorting laboratory helped tarnish the leaves can be toxic asines. The effect these sheand is studied on a small freshwater fish *Gambusia affinis* very abundant in the rivers of Ain Chkef. We chose this species because it is abundant in the rivers of the region systematically known and stable and genandically homogeneous easy to handle (small size) the effects of toxic substances testees are easily dandectable at its behavior and finally it is a very representative species of local fauna. The Gambisia were also caught in the river Ain Chkef. In this environment *Gambusia affinis* coexists with some gastropods, especially *Melanopsis* and some insects.

The Gambisia used as tested organisms were caught in autumn with a epuisette and maintained in the laboratory volume of 50L aquariums containing a few feand of waterweed and fill 3/4 full with water city. The ventilation was ensured by means of a type of aerator EENA 301 and the water temperature kept constant at 20°C using an immersion heater.

### 2.2 Preparation leaf and development tests

Leaves of both species have dried the oven at 40°C for 48 hours weighings were small batches of 2g (expressed as dry weight). Each batch of sheands is placed in a beaker containing one liter of city water. These beakers are then kept has a room temperature (about 18°C).

After 1, 4, 8 and 24h of incubation the plant material recovered from the beaker and placed in each beaker 10 Gambisia relatively homogeneous size beforehand acclimated to laboratory conditions for 20 hours. Each leaching time we had 3 beakers of 3 witnesses batches each containing the same amount of water. Water was constantly oxygenated beakers by means of pumps RENA 301 repetition. The flow was regulated by valves about 100 bubbles per minute. A daily filtration of feces was necessary to avoid any extra water contamination. The beakers containing the fish were kept at room temperature (18 to 20°C). For comparison of the results and to avoid any variation in thermal conditions of realization of testing we launched our way simultaneous trials. Indeed any variation of the temperature of a test other could result in a variation in product toxicity tests. [5] had noted that a decrease in temperature from 20°C to 13°C reduces enormously the lethal toxicity of aluminum in *Gambusia affinis*. Similarly *Artemia salina* with a decrease in temperature from 20°C to 10°C reduces the TL 50- 24 h, 182.5mg/l potassium bichromate was 128 mg/1 [22].

Every hour the beakers were examined withdrawn and degree of dead fish toxicity of different Lessivas was estimated by determining the percentage of mortality. Each time leaching and after each fortunes the mortalities recorded (average of three measuring mortality cumulated according to the incubation time) we were able to trace empirically way approaches diagrams from which we have Sand the relationship between the percentage of cumulated mortality and the incubation time. These diagrams have allowed us to compare the kinetics of mortality between the leaching time different to quantify the toxicity of different Lessivas we calculate the TL(50) (lethal Time 50% of subject) from the transformation probit [13]

2.3 Study site

The study was carried out in the river Ain Chkef (Figure 1). It a small stream whose source has Ain Chkef roughly 7 km from the city of Fes the bottom of a circus cliffs (coordinates Lambert: X = 534.75 y = 374). At the level of the source, the water is etale in a depression 4.5 m in length and 3 to 4 m wide before pouring the rest of the way. Part of the water from the source is used to power the Ain Chkef complex.

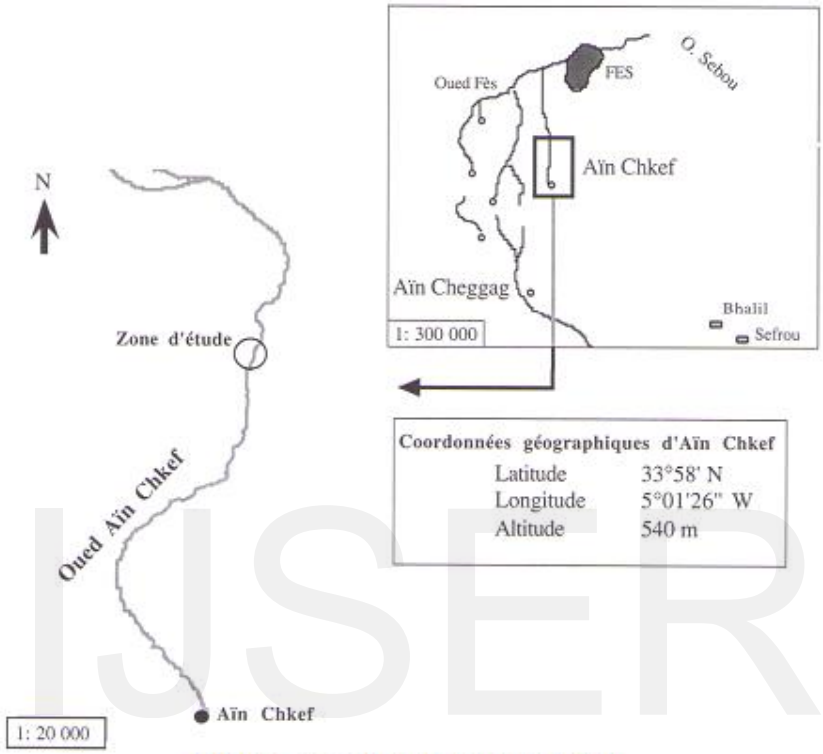


Figure 1, Location of stations study

Aquatic vegetation is constituted of filamentous green algae. Riparian vegetation is mainly composed of *Equisandum fluviatilis, Scirpus lacustris*, *Salix* sp and *Typha latifolia*. The slopes of the valley are mostly covered with *Eucalyptus camaldulensis*. Le bed of the river is covered mostly set and mud with some stones seats. The aquatic fauna is dominated by *Gambusia affinis* mainly (Little fish that plays the important role in the fight against Anopheles, consuming a large amount of larvae) and *Melanopsis prosobranch* gastropod considered as main dilaceration hardwood inputs to freshwater [8]. The bags of leaves (left batch of three bag for each point of levy) were deposited all along the banks and camouflaged under the cover of riparian vegetation that lead in water and in the tangle of roots to avoid any vandalism.

III. INTRODUCTION RESULTS AND DISCUSSION

3.1 Impact Lessivas of leaves on the behavior of Gambisia

The principle of behavioral toxicity tests and bioassays is to observe the behavior of test organisms in contact with the toxic substance under well-defined conditions. The sublethal effects generally characterize by behavioral disturbances (angel breathing etc.) physiological changes (growth reproduction and development) Biochemical (biosynthesis and function of enzymes) and histopathology these sublethal effects can lead directly or indirectly to the fatality.

At the behavioral level we have observed a few hours after the start of the tests motor disorders in Gambisia as decrease in the rate of respiratory movements manifested by constant opening lids. The fish came up very often the surface of the water to breathe. This behavior probably reflected a reduction of water oxygen levels in beakers. Numerous authors are interested in the application of behavioral toxicity tests for testing the quality of water and had observed [16] disturbances of the rhythm of swimming and mating behavior in the presence of toxic Crustaces. The exposure of *Gammarus pulex* was 0.05mg of Zn/l accelerated movement of swimming in the test medium. Other authors noted disturbances [27] of the respiratory behavior of live fish into a pond after a massive fall leaves black poplar the fish showed signs of asphyxiation. Also, they were demonstrated [10] by laboratory experiments that the fall of leaves of Laurel willow as considerably reduces the oxygen content in the receptor environment. That the presence [16] of raw powder oleonder of elvers Eels had behavioral problems swimming and breathing before dying. In similar observations [27], to ours in a small pond at the time of falling leaves of *Populus nigra*, the fish in a state of respiratory distress dated back to the water surface and let themselves easily take to the main [25]

3.2 Change in toxicity of Lessivas depending on the duration of lessivage

We have tested the effect of Lessivas of dried leaves of *Eucalyptus* (Figure 1 and 2) and Oleonder *(*Figure 3 and 4) on *Gambusia affinis*. This toxicity is mainly due to the toxic organic compounds (especially polyphenols) freed when known contact sheets with Lessivas corresponding four leaching durations (1h, 4, 8 and 24h) were tested for the two types of leaves.

The kinetics of mortality in all studied Lessivas generally show the same speed for both types of sheets. A high mortality during the first hours of incubation followed by a gradual slowdown during the rest of the time. The Lessivas 24 hours of Oleonder leaves appear very toxic. Incubation of Gambisia in these Lessivas causes a mortality of 100% in 31h probably because of their oxygen scavenging effect, while Lessivas 1h, 4 and 18h of the two types of leaves do not for the same period no effect on Gambusia. Moreover, the dried leaves of Oleonder desoxygenent much the receiver medium than Eucalyptus. The analysis of the curves of figures 3 and 5 shows that the Gambisia in mortality rates is growing as and as leaching time increases. The lethal toxicity tests we used allow us after probit transformation to assess the lethal toxicity of leachates Eucalyptus leaves and Oleonder by determining their TL 50. We note the term of leaching augments rather than toxicity increases thereby resulting in a decrease in the TL (50).

For sheets of Oleonder leachates obtained after 24 hours of leaching are 15 times more toxic than those obtained after one hour (with a 50 TL from 18.25 to 298.58 days). Eucalyptus for those values TL 50 has increased from 389.82 236.65. The concentration of toxic substance may increase over time leach but new substances may also be gradually lessivees. In matter of lethal toxicity many biological tests have been used to test the impact of leachates of leaves and needles died on biological quality of aquatic environments receiver: Test extracts from leaves of *Populus tremuloides*, *Picea Glauce*, *Pinus contorta* and *Pseudotsuga menziesii*. on Catastomus [28], of *Populus nigra*, *Salix babylonica* and *Nerium oleonder* on Artemia salina and *Gambusia affinis* [3]. But comparisons are however very difficult to establish given the differences being at the tests realization conditions by different authors.

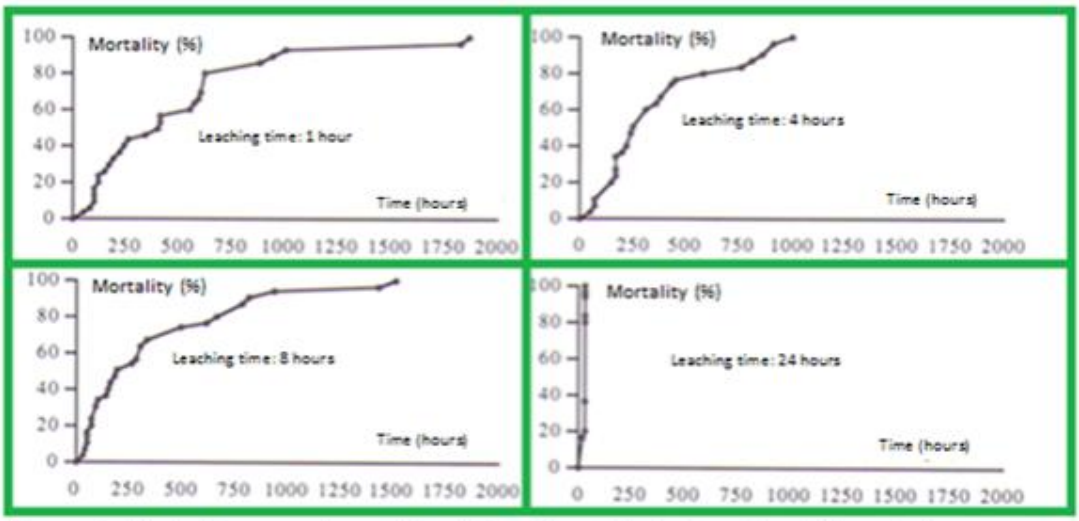


Figure 2, Mortality percentage of variation Gambisia in function of time in the presence of leachates sheets Laurier

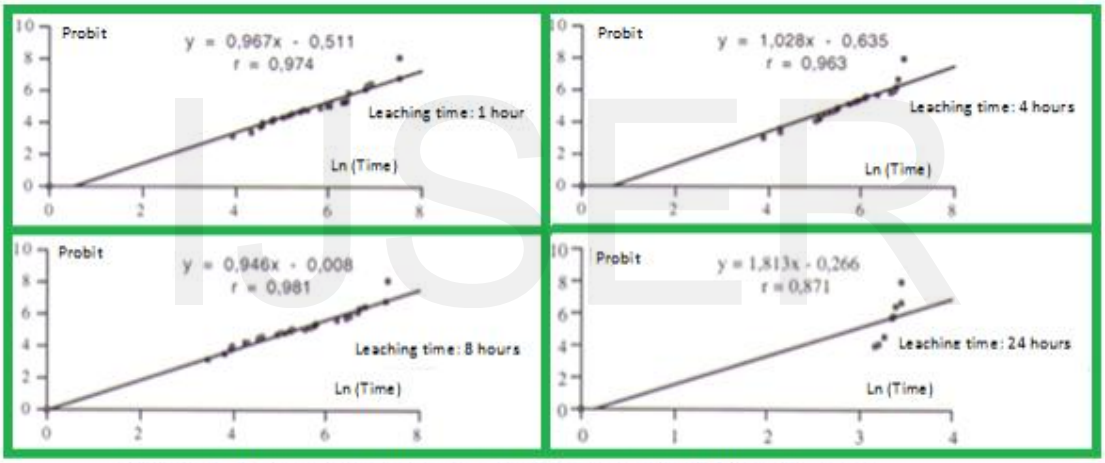


Figure 3, Percentage change of mortality of Gambisia function of time in the presence of leachates sheets Laurier Transformation probit

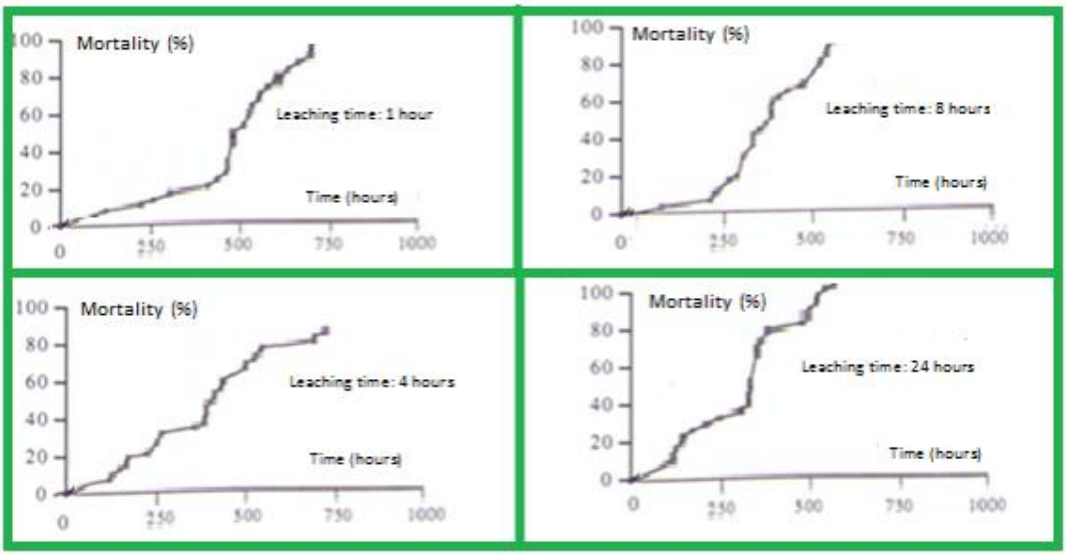


Figure 4, Percentage change of mortality of Gambisia in function of time in the presence of leachates Eucalyptus

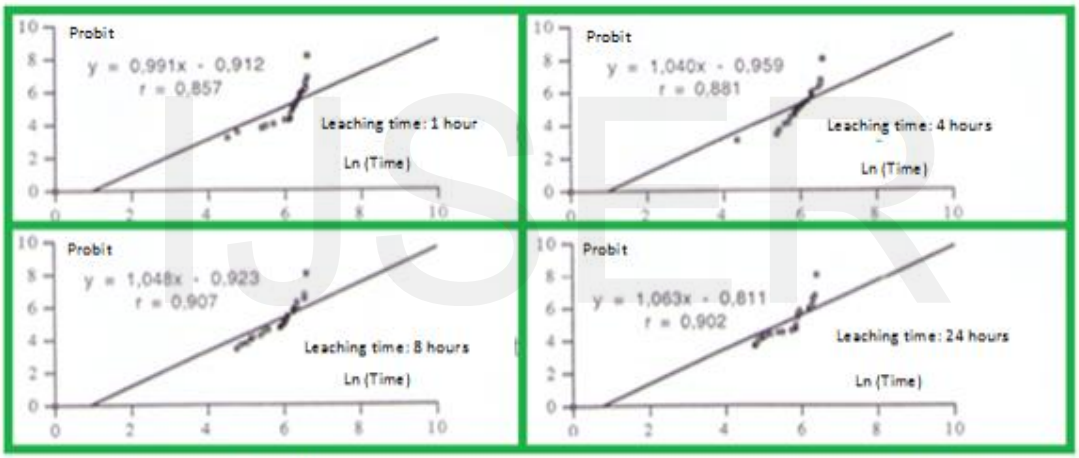


Figure 5, Mortality percentage variation of Gambisia in function of time in the presence of leachates Eucalyptus leaves
Transformation probit

## IV. CONCLUSION

The comparative analysis of the toxic effect of both vegetable species studied shows that the leaves of Oleonder are very toxic compared to those of Eucalyptus. Leaching time proves a limiting factor in the mortality of Gambisia. The toxicity of Eucalyptus leaves and Oleonder could be due to their content of polyphenols and other toxic water-soluble substance. As a measure that augments leaching duration toxicity also increases which resulted in a decrease in the TL (50). Thus it was found that there is a significant relationship between the toxicity of the leaves and their phenolic content. Incubation of Gambisia in these Lessivas causes mortality to 100% in 31h probably because of their oxygen scavenger because the dried leaves of Oleonder desoxygenent much the receiver medium than those of *Eucalyptus*. The mortality rate of Gambisia is growing as and as leaching time increases. The Lessivas 24 hours of

Oleonder leaves appear very toxic. They are 15 times more toxic than those obtained after one hour. Whereas those Eucalyptus values TL 50 decreases slightly.

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