

## The effect of ghabich leaves extract on germination and seedlings growth of tomato

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### Abstract

The aim of this study was to determine the effect of different concentrations of Ghabich (*Guiera senegalensis* J.F. Gmel) leaves extract on germination and seedling growth in tomato under laboratory conditions (in petri dishes). The concentrations used were 2.5, 5, 7.5 and 10%, each treatment with four replications. The study was carried out in two different experiments. In experiment one there was no significant differences in the germination rate and average length of the plumule between the different concentrations and control group. The best concentration 2.5% caused growth in the length of the radicle of 36.8 mm which was significantly different from the rest of the concentrations and the control (27.8 mm). In Experiment 2, the treatments 10% and 7.5% of the Ghabich extract had the lowest germination rate with significant differences compared with 5%, 2.5% and the control. The lowest mean length was for the 7.5% concentration (20.3mm) which was significantly lower compared with the other concentrations and control. There was no significant difference in the average length of the Radicle between the different concentrations and the control group.

Keywords: Concentration, *Guiera senegalensis*, plumule, radicle

### Résumé

Le but de cette étude était de déterminer l'effet de différentes concentrations d'extrait de feuilles de *Guiera senegalensis* J.F. Gmel sur la germination et la croissance des plantules de tomates dans des conditions de laboratoire (en boîtes de Pétri). Les concentrations utilisées étaient de 2,5, 5, 7,5 et 10%, chaque traitement étant répété quatre fois. L'étude a été réalisée dans deux expérimentations différentes. Dans la première, il n'y a pas eu de différences significatives du taux de germination et de la longueur moyenne du plumule, entre les différentes concentrations et le groupe témoin. La meilleure concentration de 2,5% a provoqué une croissance de la longueur de la radicule de 36,8 mm qui était significativement différente du reste des concentrations et du témoin (27,8 mm). Dans l'expérimentation 2, les traitements de 10% et 7,5% de l'extrait de la plante avaient les taux de germination les plus faibles avec des différences significatives par rapport à 5%, 2,5% et le témoin. La longueur moyenne la plus basse était pour la concentration de 7,5% (20,3 mm) qui était significativement plus faible que celle des autres concentrations et du contrôle. Il n'y a pas eu de différence significative dans la longueur moyenne de la radicule entre les différentes concentrations et le groupe témoin.

Mots clés: Concentration, *Guiera senegalensis*, plumule, radicule

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## Introduction

Tomato (*Lycopersicon esculentum* Mill.) is an important vegetable crop in most regions of the world (Alsadon *et al.*, 2006). Allelopathy is defined as any direct or indirect influence of one plant on the other plants (including the microorganisms) via release of chemicals. These effects are selective, depending upon concentration and residues types, either inhibitory or stimulatory to the growth of companion or subsequent crops or weeds (Ul Subtain *et al.*, 2014).

Plant growth promotion through allelochemicals have direct as well as indirect effects on plants. Indirect effects include alteration in soil physiochemical properties, change in microbial populations and differential nutrient availability to plants. Direct action of secondary metabolites is a function of different biochemical and physiological changes imparted in growth metabolism of plants (Farooq *et al.*, 2013). The allelochemicals may inhibit seed germination, shoot/root growth, nutrient uptake, or may attack a naturally occurring symbiotic relationship thereby destroying the plant's usable sources of a nutrient and effect allelopathic suppression of weeds to crops (Suwal *et al.*, 2010). The objective of this study was to assess allelopathic effect of Ghabish (*Guiera senegalensis* J.F. Gmel) on germination of tomato seedlings.

## Material and methods

The experiment was conducted under laboratory conditions in 2011. Twenty five gram of powdered leaves of Ghabich (*Guiera senegalensis* J.F. Gmel) added to 250 ml of distilled water and mixed by blender (experiment 1), shaker (experiment 2) and kept for 24 hours at room temperature and then filtered by section pump was used in the study. The filtrates served as the stock solution of 10 % concentration. By subsequent dilution with distilled water leaves extracts of 7.5 %, 5 %, and 2.5 % concentrations were prepared. Tomato seeds were surface sterilized by dipping into 0.5 % aqueous solution of sodium hypochlorite and rinsed several times with distilled water. Subsequently, 10 seeds of tomato were placed in separate petridishes lined with layer of filter paper which was moistened with 5 ml of aqueous extract. Control was maintained with distilled water.

Each treatment was replicated four times. Germination percentage, radicle and plumule lengths were measured 10 days after sowing. The data were analyzed statistically using SPSS 20 version.

## Results and discussion

The different concentrations of Ghabish in Experiment 1 (2.5%, 5%, 7.5%, 10%) resulted in significant difference in the germination rate and the length of the plumule compared with the control. The best treatment in the length of radicle was with the 2.5% concentration (36.8 mm) significantly higher than from the rest of the treatments and the control (27.8 mm). This effect is probably explained by the presence of growth-stimulating substances in the concentration of 2.5% and the increased concentration reduces this effect. In Experiment 2, the treatments of 10% and 7.5% concentrations of the Ghabich leaves extract gave the

lowest germination rates which were lower compared to for the 5% and 2.5% extracts and the control. This may be explained by the presence of high levels of inhibitory substances that kill the seeds or inhibit germination at 10% and 7.5% concentration. The lowest average length of the plumule was from the 7.5% concentration (20.3 mm) which was significantly lower compared to the rest of the treatments and the control (35.7 mm). This is probably due to the presence of growth inhibiting materials in the germination solution at 7.5% and 10% (28.5 mm).

The difference between results obtained in Experiment 1 and Experiment 2 could be due to the fact that in the first experiment, the extract was first mixed with the blinder, unlike in the second where it was mixed with a shaker.

**Table 1. The effect of Ghabich leaves extract on tomato seedlings growth (experiment 1)**

Control	Groups	Plumule	P value	Radicle	P value
Plumule length (41.6 ± 16.6)	2.5%	50 ± 13.6	0.090	36.8 ± 8.5	0.037*
	5%	40.7 ± 10.4	0.839	31 ± 6.1	0.419
Radicle length (27.8 ± 16.6)	7.5%	42.7 ± 11	0.806	31.5 ± 6.9	0.366
	10%	43.9 ± 11.6	0.615	28.4 ± 5.4	0.879

**Table 2. The effect of Ghabich leaves extract on tomato seedlings growth (experiment 2)**

Control	Groups	Plumule	P value	Radicle	P value
plumule length (35.7 ± 17.9)	2.5%	36.4 ± 14.8	0.904	22.7 ± 13.6	0.152
	5%	42.8 ± 14.1	0.196	22.1 ± 7.9	0.116
Radicle length (15.9 ± 14.1)	7.5%	20.3 ± 14.9	0.008*	14.2 ± 8.7	0.662
	10%	28.5 ± 16.7	0.218	14.9 ± 8.5	0.799

## Conclusion

The use of Ghabich leaves extract as growth promoter compared with the control one has different effect in where the concentration of 2.5% promoted the growth promoted but the concentration of 7.5% and 10% caused growth inhibition.

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