

## **Effect of expired pendimethalin (Stomp) on germination and seedling development of Mango (*Mangifera indica*)**

Djelovanje isteka roka pendimetalina (Stomp) na klijanje i razvoj mlade biljke manga (*Mangifera indica*)

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### ABSTRACT

Effect of expired herbicide on seed germination and seedling development of Mango (*Mangifera indica*) was investigated using Pendimethalin herbicides that have expired for 7, 5 and 1 years respectively. Two concentrations 100 and 150ml/l of each of the expired herbicides were used as the treatment concentrations for the investigation. Mango germination was delayed in all the herbicide treatments but not in the control treatment. Germination rate was consistently higher in the control treatment than in all the herbicide treatments except the herbicide that expired in 2011. There were no herbicide injuries nor growth retardation on Mango seedlings except slight stem distortion and reduced leaf size at the early emergence stage.

Keywords: expired, germination, herbicide, mango, *Mangifera indica*, pendimethalin

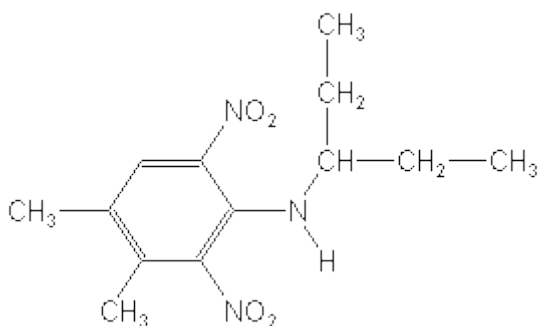
### SAŽETAK

Djelovanje isteklog roka herbicida na klijanje sjemena i razvoj biljke manga (*Mangifera indica*) istraživano je primjenom herbicida pendimetalin čiji je rok istekao 7, 5 i 1 godinu. Dvije koncentracije od 100 i 150 ml/l svakoga od spomenutih herbicida primijenjene su kao koncentracije tretmana u istraživanju. Klijanje manga zakasnilo je u svim tretmanima herbicida osim u kontrolnom tretmanu. Stopa klijanja bila je stalno viša u kontrolnom tretmanu nego u tretmanima s herbicidom osim u tretmanu s herbicidom kojemu je rok istekao 2011. Nije bilo oštećenja zbog herbicida niti zaostatka u rastu biljaka manga osim neznatnog nakrivljenja stabljika i smanjenja veličine listova na ranom stadiju klijanja.

Ključne riječi: istekao rok, klijanje, herbicid, mango, *Mangifera indica*, pendimetalin

## INTRODUCTION

Herbicides are chemicals used to control weeds either in cropped or noncropped lands. These chemicals like other chemicals have shelf life and are so indicated by their respective manufacturers as expiring dates. However, some of the chemicals deemed to have expired may still retain some potency. Pendimethalin is a preemergence herbicide belonging to dinitroaniline group. Pendimethalin is known that it does not inhibit seed germination but it inhibits early seedling growth shortly after germination through the disruption of cell division (Das, 2011). It has the molecular and structural formulas as  $C_{13}H_{19}N_3O_4$



### ***N*-(1-ethylpropyl)-2,6-dinitro-3,4-xylidine (IUPAC)**

**<http://www.alanwood.net/pesticides/pendimethalin.html> ( Wood,2013)**

and Pendimethalin is a selective herbicide used to control most annual grasses and certain broadleaf weeds. It is used both as pre-emergence, that is before weed seeds have sprouted, and early post-emergence (Washington State, 2004). Pendimethalin is used to control annual broadleaf weeds in new and established nursery plantings. It is applied at the time of planting or prior to weed seed germination. Pendimethalin is applied to newly planted trees before the buds swell but after the ground has settled around the trees and cracks are absent (Washington State, 2004).

Mango belongs to the family *Anacardiaceae*. It is a deep-rooted, evergreen plant which can develop into huge trees, especially on deep soils. The height and shape varies considerably among seedlings and cultivars. Under optimum climatic conditions, the trees are erect and fast growing and the canopy can either be broad and rounded or more upright (Salim.et al., 2002).

Mango can be propagated by seeds or by grafting. For commercial purpose, grafting is the most appropriate method because it maintains the genetic characters from the propagated variety (Cordeiro et al., 2006) seed propagation is however, easier and cheaper (Opeke, 1987). Olorunmaiye *etal* (2011) reported in an earlier germination study on local mango the effect of seed weight influence on some of the seedlings growth parameters.

The background problem solving purpose of this investigation is to allay the fear of what to do with expired herbicides among the users especially among rural farmers. The pertinent decision arises whether or not to use expired herbicides as weed control agent and should they be used, what effects will they have on both weeds and crops?. Most often, weeds are controlled with herbicides either on sole crop fields or intercrop of arable crops or between tree crop like Mango and arable crops. Herbicides are frequently used to control weeds in nurseries and orchards. The objectives of this investigation are, to find out the effects of expired pendimethalin herbicide on seed germination and seedling development of mango (*Mangifera indica*) as well as the efficacy of the same.

## MATERIALS AND METHODS

Five seeds of a local Mango variety were planted in planting buckets previously filled with sandy loamy soil and replicated thrice in a randomized arrangement in an open space in the Department of plant Biology University of Ilorin, Ilorin, Nigeria between June and September, 2012. Pendimethalin that had expired 7, 5 and 1 years respectively were used for this investigation. Two concentrations 100 and 150ml/L of each of the expired herbicides were used as the treatment concentrations. 30mls of each of the concentrations were added to each of the buckets previously filled with sandy loamy soil and well moistened with water. Germination counts of Mango seeds were taken as well as other parameters like stem height, number of leaves, leaf area and seedling dry matter. Data collected were analyzed using the statistical package for social sciences (SPSS 20). Means were also separated using Duncan Multiple range test (DMRT)

## RESULTS

Results of this investigation were presented in Tables 1 & 2 below. Seed germination was delayed in all the herbicide concentrations three and four

**Table 1. Effect of expired pendimethalin on germination of Mango (*Mangifera indica*)**

**Tablica 1.: Djelovanje isteka roka pendimetalina na klijavost Manga (*Mangifera indica*)**

Date expired & conc.(ml/L)	Time						
	3WAP	4WAP	5WAP	6WAP	7WAP	8WAP	9WAP
Control	0.33a	1.67a	2.33a	2.67ab	3.33ab	3.33ab	3.33ab
2005 conc.1	0.00a	0.00c	0.33b	1.33b	2.00c	2.00c	2.33b
2005 conc.2	0.00a	0.00c	1.00ab	2.00ab	2.33cb	2.33cb	2.33b
2007 conc.1	0.00a	0c.00	0.67ab	1.33b	2.33cb	2.33cb	2.33b
2007 conc.2	0.00a	0.67cb	1.33ab	2.00ab	3.00abc	3.00abc	3.00ab
2011 conc.1	0.00a	1.00b	2.00ab	3.00a	3.67a	3.67a	4.00a
2011 conc.2	0.00a	0.33cb	1.00ab	2.00ab	2.33cb	2.33cb	2.33b

Values carrying the same number(s) along the same column are not statistically different at ( $p < 0.05$ ). WAP = Week After Planting

**Table 2. Effect of expired pendimethalin on Seedling development of Mango (*Mangifera indica*) at 9WAP**

**Tablica 2.: Djelovanje isteka roka pendimetalina na razvoj mlade biljke Manga (*Mangifera indica*) nakon 9WAP**

Date expired & conc (ml/L)	Stem height (cm)	No.of leaf	Leaf Area (cm <sup>2</sup> )	Fresh. wt (g)	dry wt.(g)
Control	23.93ab	8.00a	29.77b	9.67ab	2.33abc
2005 conc.1	20.63b	8.33a	39.81ab	9.33ab	2.33abc
2005 conc.2	41.00a	9.67a	34.12ab	13.00a	3.33ab
2007 conc.1	29.20ab	7.67a	38.13ab	9.00ab	2.00cb
2007 conc.2	29.83ab	6.67a	39.58ab	9.33ab	2.33abc
2011 conc.1	17.93b	7.33a	25.64b	7.33b	1.67c
2011 conc.2	34.80ab	9.00a	53.48a	13.33a	3.67a

Values carrying the same number(s) along the same column are not statistically different at ( $p < 0.05$ )

weeks after planting in some (Table 1). There was no inhibition of germination in all the pendimethalin concentrations as germination increased steadily with time and some concentrations were close to or at par with the control treatment (Table 1). Seedling development was not hindered by expired pendimethalin as data from vegetative parameters like stem height, number of leaves, leaf area, fresh and dry weights were at par with the control or higher in most cases (Table 2).

## DISCUSSION

Results of this investigation showed that there was a little delay but no inhibition in germination of mango seeds by expired pendimethalin herbicide. This observation was consistent with the earlier reports of other workers that pendimethalin will not inhibit germination of seeds but kill the germinating seeds that are susceptible to it (Das, 2011, Olorunmaiye, 2010, Akobundu, 1987, Adesina *et al*, 1998). Pendimethalin is a selective herbicide that is used to control grass and few broad leaf weeds. Mango is a woody tree crop which may be tolerant to pendimethalin and this can be used in mango nurseries and plantations as weed control agent. Increase in the vegetative growth under the various herbicide concentrations may be due to the weed free condition that eliminated possible competition with mango seedlings. Some weeds were removed from the control pots (data not reported).

## CONCLUSION

Results from this investigation reveal that expired pendimethalin has some effect on weed control and when used in mango nursery and plantation will not inhibit both seed germination and seedling development.

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