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JOURNAL OF APPLIED SCIENCES RESEARCH

ISSN: 1819-544X EISSN: 1816-157X

JOURNAL home page: http://www.aensiweb.com/JASR 2015 August; 11(13): pages 1-5.

Published Online 28 August 2015 **Research Article**

Assessment of Pre Emergence Herbicides (Chlorotoluron, Isoprotoron and Methabenzthiazuron) and Post Emergence Herbicides (Diclofop-Methyl and Pendimethan) In Controlling Italian Rye-Grass (*Lolium multiflorum*) Growing With Barley (*Hordeum vulgare*)

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Received: 12 July 2015; **accepted:** 8 August 2015; **revised:** 22 August 2015

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ABSTRACT

In two glasshouse experiments, range of herbicides was applied pre or post emergence to examine their effect in controlling Italian ryegrass (*Loluim multiflorum*) grown with barley. In experiment 1; Treatment by one of the three herbicides named; Chlorotoluron, Isoprotoron or Methabenzthiazuron to Italian ryegrass (*L. multiflorum*) grown with barley during pre emergence stage showed clear damage on the weed without a prominent effect on barley plants. Italian ryegrass (*L. multiflorum*) was controlled significantly ($P<0.01$) by all the three herbicides. However, the three herbicides differed significantly ($P<0.05$) in their affecting dose. Chlorotoluron gave effective control of *L. multiflorum* at dose of 2kg a.i/ha with less than 10% of mean of ryegrass plants/ pot survived and only a slight damage on barley was observed. Isoproturon and methabenzthiazuron were less effective in controlling the weed as more than 30 % of *L. multiflorum* plants survived at different doses applied while barley plants were not affected significantly by the chemicals. In experiment 2; two herbicides named; Diclofop-methyl or Pendimethalin were applied as post emergence treatment to control *L. multiflorum* grown with barley. The herbicide Diclofop-methyl achieved an effective control of Italian ryegrass (*L. multiflorum*) associated with barley even at rates as low as 0.25 kg a.i/ha. Mean of ryegrass numbers and fresh weight (20 plants)/Pot were decreased significantly and only few plants of *L. multifloruim* survived at 1kg/ha however, they were very small in size and badly damaged. Barley plants were not damaged by Diclofop-methyl treatments at all applied doses. Pendimethalin created a significant effect ($P<0.05$) on *L. multiflorum* numbers /pot or fresh weight (20 plants/pot) at doses; 0.125 or 0.25 kg a.i/ha. However, at 1kg a.i/ha there was about 40% reduction in weed numbers/pot and its fresh weight (20 plants/pot) which indicate low control effect of this chemical. There was no evidence of damage to barley plants by Pendimethalin at all tested rates.

Keywords:Italian ryegrass (Lolium multiflorum), Barley (Hordeum vulgare), Chlorotoluron, Isoprotoron, Methabenzthiazuron, Diclofop-methyl, Pendimethalin

INTRODUCTION

Barley (*Hordeum vulgare*) is one of the oldest cultivated cereal grains in the world [4]. It is called the founder crop of old world neolithic food production and one of the earliest domesticated crops. It is also considered to be the main cereals of the Mediterranean belt of agriculture [28,29]. Italian ryegrass (*Lolium multiflorum)* is one of the most troublesome weeds in winter wheat production [19]. *Lolium spp* are a herbaceous annual, biennial or perennial grass that can be grown for silage or as a cover crop. They also an be grown as an annual lawn grass and ornamental grass [18,10]. Some of the *Lolium sp* readily naturalize in temperate climates and can become a noxious weed in agricultural areas or an invasive species in native habitats.

Weeds are a major problem in crop production in the world and significantly decrease crop yield [17]. Weeds can be controlled by manual hoeing, mechanically and by using herbicides. Manual weeding is labor intensive and possible only on small scale while, mechanical weed control is

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possible in row cropping and leaves intra row weeds. Herbicides offer the most practical, effective and economical means of reducing early weed competition and crop production losses [27,26,5]. Herbicides are commonly known as weed killers used to kill unwanted plants. Selective herbicides kill specific targets, while leaving the desired crop relatively unharmed. Some of these act by interfering with the growth of the weed and are often synthetic mimics of natural plant hormones [3].

Methabenzthiazurn 1-(1,3-Benzothiazol-2-yl)-1,3-dimethylharnstoffon is used for the control of a spectrum of grasses in cereals, legumes, maize, garlic and onions. It is used in combination with other herbicides in vineyards and orchards [20]. Chlorotoluron 3-(3-chloro-*p*-tolyl)-1,1dimethylurea is a pre- or early post-emergence herbicide widely used to control annual grasses and broad-leaved weeds in winter cereals [15,6]. Isoprotoron 3-(4-isopropylphenyl)-1,1-dimethylurea; 3-p-cumenyl-1,1-dimethylurea is a selective systemic herbicide used as pre- or post-emergence to control annual grasses [8,24].

Diclofop-methyl is a restricted use herbicide but was used on controlling grass weeds in wheat and barley fields [2,13]. It was found to control or suppresses various grass weed species [7]. Diclofop-methyl has been known as well as a selective post emergence aryloxy phenoxy propionic acid herbicide primarily used to control wild oat (*Avena fatua* L.) and other annual graminaceous weeds in wheat, barley, and soybean [7]. Pendimethalin *N*-(1-ethylpropyl)-2, 6- dinitro-3-4 xylidine is usually used as a preparation of stomp 330E or mixed with other herbicide. Stomp 330 E is used for the eradication of annual grasses and some broad-leaved weeds in corn, soya bean, potato, wheat, onion, tomato, cabbage, and pepper (14). The aim of this research work was mainly to assess the effectiveness of a range of herbicides (Methabenzthiazuron, Isoprotoron, Chlorotoluron, Diclofop-methyl and Pendimethan) when applied pre or post emergence to control Italian ryegrass associated with barley.

MATERIALS AND METHODS

Two experiments were carried out in the glasshouse with temperature in the glasshouse ranging between 14 to 20 C°. 10 cm^2 pots were filled with John Innes No. 1 compost. 50 seeds/pot of *Lolium multiform* were sown on the surface and 10 seeds/pot of barley cv. Glost were sown 1 cm deep. In experiment one, herbicides; Methabenzthiazuron, Isoprotoron and Chlorotoluron were applied as pre-emergence treatments at 5 different doses; methabenzthiazuron at; 0, 1, 1.5, 2, 3 kg a.i/ha; Isoproturon at; 0, 0.5, 1, 1.25, 1.5 kg a.i/ha and chlorotoluron at; 0, 1.5, 2, 2.5, 3 kg a.i/ha. The applied does of the chemical were chosen from previous studies. The chemicals were applied three days after sowing. There were four replicacts of each treatment with a total of 60 pots. Observations were taken two weeks from herbicides application by counting the number of plants of *L. multiflorum* and barley and taking the fresh weight /20 plants of the weed and the crop. In experiment two, herbicides; Diclophop-methyl and pendimethalin were applied as a post-emergence treatment at rates of 0, 0.125, 0.25, 0.5 and 1kg a.i/ha. The herbicides were applied at the two leaf stage of the crop. There were four replicacts of each treatment with a total of 40 pots. Observations in experiment two were taken four weeks from herbicides application by counting the number of plants of *L. multiflorum* and barley and taking the fresh weight /20 plants of the weed and the crop. In both experiments, herbicides were sprayed with a hand sprayer and were applied inside the glasshouse in a stable weather conditions. Regular watering took place during both experiments term. Data were analyzed statistically in SAS program.

RESULTS:

Experiment 1:

1.1 Effect of Chlorotoluron on L. multiflourum and barley emergence and growth:

Italian ryegrass was controlled significantly ($p<0.01$) by all of the herbicides used but the three herbicides differed significantly ($p<0.05$) in their effect. The application of chlorotoluron as a pre emergence treatment gave effective control of *Lolium multiflorum* specially at dose of 2kg a.i/ha (Figs 1 and 2). Only four ryegrass plants emerged out 50 sown seeds at dose of 2kg a.i/ha. Slight damage on barley was observed.

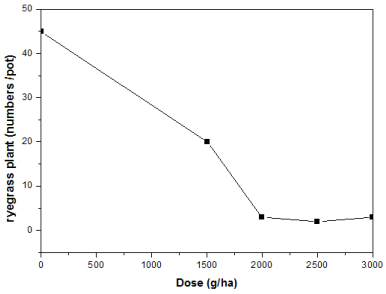

Fig. 1: Effect of Chlorotoluron on annual ryegrass plants (numbers /pot).

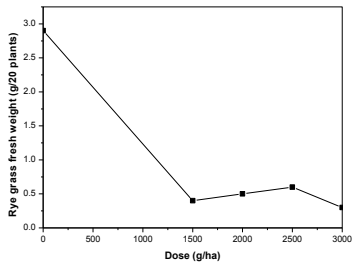

Fig. 2: Effect of Chlorotoluron on annual ryegrass fresh weight (g/20 plants).

1.2 Effect of Isoproturon on L. multiflourum and barley emergence and growth:

The application of isoproturon as a pre emergence herbicide gave some control to *L. multiflorum* but was less effective than the herbicide chlorotoluron as more than 30% of *L. multiflorum* seeds emerged escaping the chemical effect at different doses (Figs 3 and 4). Barley was not affected significantly by the chemical.

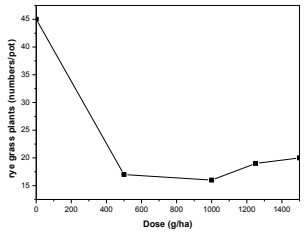

Fig. 3: Effect of Isoproturon on annual ryegrass plants (numbers /pot).

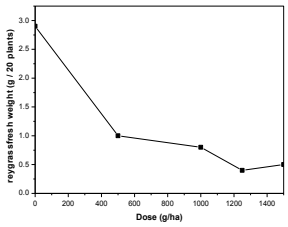

Fig. 4: Effect of Isoproturon on annual ryegrass fresh weight (g/20 plants).

1.3 Effect of methabenzthiazuron on L. multiflourum and barley emergence and growth:

The application of the herbicide methabenzthiazuron as pre emergence treatment gave some control of *L. multiflorum* but again was less effective than the herbicide chlorotoluron. The most effective dose was at 2 kg a.i /ha as about 60 % of *L. multiflorum* seeds were inhibited to emerge. Barley was not affected significantly again by the chemical.

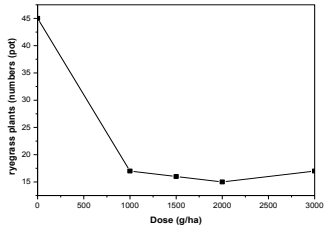

Fig. 5: Effect of Methabenzthiazuron on annual ryegrass plants (numbers /pot).

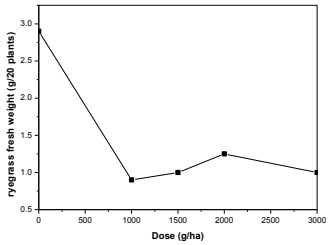

Fig. 6: Effect of Methabenzthiazuron on annual ryegrass fresh weight (g/20 plants).

Expermint 2:

2.1. Effect of Diclofop-methyl on L. multiflourum and barley emergence and growth:

The application of the herbicide Diclofop-methyl as a post emergence herbicide gave effective of *Lolium multiflorum* even at low rates. At 0.25 kg a.i/ha of the chemical, plant numbers / pot and plant fresh weight / 20 plants were decreased by about 50 % (Figs7 and 8). Few plants of the weed survived at dose of 1kg a.i/ha and those were very small and damaged. Barley was undamaged by any of the Diclofo-methyl treatments.

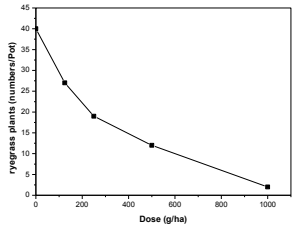

Fig. 7: Effect of Diclofop-methyl on ryegrss (numbers /pot).

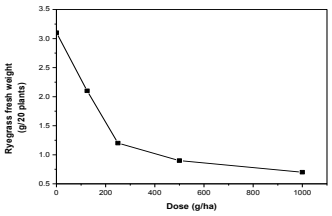

Fig. 8: Effect of Diclofop-methyl on ryegrss fresh weight (g/20 plants).

2.2. Effect of Pendimethalin on L. multiflourum and barley emergence and growth:

The application of the chemical Pendimethalin as post emergence herbicide at 0.125 and 0.25 kg a.i/ha had little effect on *L. multiflorum* plants numbers or fresh weight. However, at the dose of 1kg a.i/ha there was about 50% reduction in plant numbers and plant fresh weight (g) / 20 plants (i.e. 50% growth reduction) (Figs. 9 and 10). There was no evidence of damage to barley by the herbicide pendimethalin at any of the tested rates.

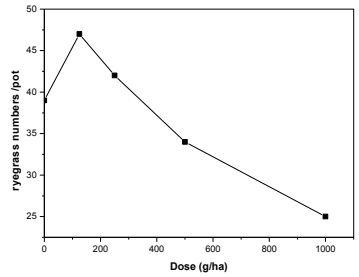

Fig. 9: Effect of Pendimethalin on ryegrass numbers.

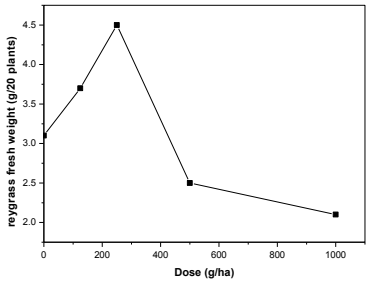

Fig. 10: Effect of Pendimethalin on ryegrass fresh weight (g/20 plants)

DISCUSION:

Italian ryegrass (*Lolium multiflorum*) was controlled significantly ($p<0.01$) by the herbicides; Chlorotoluron, Isoproturon and methabenzthiazuron. Others reported clear damage from these chemicals with good crop safety in wheat [11,9].

The application of chlorotoluron as a pre emergence treatment gave effective control of *Lolium multiflorum* especially at dose of 2kg a.i/ha. This chemical was mentioned to be effective in controlling grass weeds in cereals [22]. Tag-El-Din *et al.* , [25] reported as well excellent control of weeds associated with wheat at dose of 2.5 kg/ha of chlorotoluron when applied as post-emergence treatment. However they reported sever symptoms affected wheat growth and yield. Slight effect of the chemical was seen on barley in this research work which suggest the better use of this chemical as pre-emergence treatment. When isoproturon was applied as a pre emergence herbicide, it gave some control to *L. multiflorum* but was less effective than the herbicide chlorotoluron as more than 30% of *L. multiflorum* seeds emerged escaping the chemical effect at different doses. Barley was not affected significantly by the chemical. It was reported the efficiency of the chemical on controlling other grass weeds such as sterile oat (*Avena Sterllis*) but less effective in controlling *Lolium sp* [21].

Application of the herbicide methabenzthiazuron as pre emergence treatment gave some control of *L. multiflorum* but again was less effective than the herbicide chlorotoluron. The most effective dose was at 2 kg a.i /ha disallowing about 60 % of *L. multiflorum* to emerge. Barley was not affected significantly again by the chemical. Methabenzthiazuron gave good weed control in potato fields when applied as a pre emergence treatment at 1-1.5 kg/ha resulting in a higher crop yield [16]. Similar result was achieved by the application of methabenzthiazuron as pre emergence treatment in peas fields [23]. This suggest the efficiency of this chemical as pre-emergence treatment to control weeds with high safety to the crop.

The application of the herbicide Diclofop-methyl as a post emergence herbicide gave effective of *Lolium multiflorum* even at low rates. At dose of 0.25 kg a.i/ha of the chemical, plant numbers / pot and plant fresh weight / 20 plants of *L. multiflorum* were decreased by about 50 %. Few plants survived at dose of 1kg a.i/ha and those were very small and damaged. Barley was undamaged by any of the Diclofo-methyl treatments. Other have reported good control of *Lolium spp* in wheat with Diclofo-methyl at rates ranging from 0.375 to 1.5 kg a.i/ha [2,13]. Tag-El-Din *et al.*, [25] confirmed effective effect on weeds when this chemical applied as as a post emergence treatment in wheat. However, some phytotoxicity effect was reported on the crop but rapidly recovered. It is important to choose the appropriate dose of this chemical when applied as post emergence treatment to avoid any effect on the crop.

The application of the chemical Pendimethalin as post emergence herbicide at 0.125 and 0.25 kg a.i/ha had little effect on *L. multiflorum* plants numbers or fresh weight. However, at 1kg a.i/ha there was about 50% reduction in plant numbers and plant fresh weight / 20 plants (i.e. 50% growth reduction) and there was no evidence of damage to barley by the herbicide pendimethalin at all tested rates. However, this chemical achieved better weed control when applied at dose 1.3 kg a.i/ha as pre emergence treatment in onion field [12]. Similar result was achieved by the application of this chemical as pre emergence treatment in controlling *L. multiflorum* associated with barley at dose of 0.5 kg/ha [1]. However, sever effect on the crop was reported. It is recommend to apply this chemical at low doses to avoid negative effect on the crop.

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