SHORT COMMUNICATION

KCl depresses physiologic leaf spot of barley (*Hordeum vulgare* L. 'Duke')

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Zhang, M., Nyborg, M. and Solberg, E. 1998. **KCl depresses physiologic leaf spot of barley (*Hordeum vulgare* L. 'Duke').** Can. J. Plant Sci. **78**: 513–514. Physiologic leaf spot on barley in the greenhouse was suppressed with KCl fertilization. The area covered by the leaf spot was 8.1% without fertilization, up to 13.7% with K_2SO_4, but with KCl the amount was only 0.3 and 3.1% for 75 and 25 kg K ha^{-1}, respectively. Suppression of the leaf spotting was not due to K^+ or SO_4^{2-}, but Cl^-.

Key words: KCl fertilization, Physiologic leaf spot

Zhang, M., Nyborg, M. et Solberg, E. 1998. **Le KCl combat l'apparition de la tache foliaire physiologique de l'orge (*Hordeum vulgare* L. 'Duke').** Can. J. Plant Sci. **78**: 513–514. Nous avons constaté en serre que KCl réduit l'apparition de la tache foliaire physiologique (moucheture brune) dans les cultures d'orge. La surface foliaire couverte par la tache était de 8,1 % sans fumure et atteignait jusqu'à 13,7 % en présence K_2SO_4, mais en présence de KCl elle n'était, respectivement, que de 0,3 et 3,1 % aux doses d'épandage de 75 et 25 kg K ha^{-1}. L'effet sur la tache était dû non pas à K^+ ou SO_4^{2-} mais à Cl^-.

Mots clés: Fumure au KCl, tache foliaire physiologique, moucheture brune

Researchers have reported that plant diseases were suppressed by KCl fertilizer. Disease suppression in barley has been attributed to the presence of the Cl^- because additions of NH_4Cl or KCl reduce infection by net blotch (Beaton 1980). The Cl^- component of KCl and other sources supplying Cl^- to plants have been shown to suppress take-all, stripe rust, glume blotch, halo spot, net blotch and common root rot (Beaton and Sekhon 1985; Huber and Arny 1985; Goos 1989). Mohr et al. (1995) reported chloride reduced the severity of common root rot but not spot blotch in barley. Engle (1995) reported that plant chloride nutrition had a profound effect on physiological leaf spot in selected winter wheat cultivars. Physiologic leaf spot on barley was found both in the greenhouse and fields (Mathre 1982). It occurs with high temperature and high humidity, but the exact conditions are not clearly understood (Clark et al. 1979).

From June to September of 1995, we conducted experiments in the greenhouse (23 ± 5°C) at the University of Alberta to study the release rate of polymer-coated KCl, and K^+ uptake in barley (cv. Duke) from non-coated and polymer-coated KCl, and K_2SO_4 applied in soil. During the experiment, we observed that the degree of physiologic leaf spot in barley was less in the KCl treatments than in the K_2SO_4 treatments.

The treatments were: no fertilizer addition, KCl coated KCl I, coated KCl II, K_2SO_4, coated K_2SO_4 I, and coated K_2SO_4 II. There were two rates of application, 25 and 75 kg K^+ ha^{-1} for each of the KCl treatments, but only one rate for the K_2SO_4 treatments. Polymer-coated K^+ fertilizers were prepared by encapsulating fertilizer particles with a polymer so that the K^+ was released in a timely manner. Coated I had a thinner coating and a faster release rate than coated II. There were 10 treatments, each with three replications. The experiment was a complete randomized block design. Eight barley seeds were grown in a Dark Gray Chernozemic soil with water content of 90% field capacity. Nitrogen, phosphorus, and sulfur were also applied into soil at a rate of 200, 30, and 20 kg ha^{-1}, respectively. The experiment started on 2 June 1995. Symptoms of physiologic leaf spot were observed in July and were measured at plant heading on 14 August. Percent leaf area covered by the brown spots was assessed on the penultimate leaf. Four leaves were measured and then averaged from each replicate. The data were statistically analyzed for analysis of variance (ANOVA), and for the test of least significant difference (LSD), using SAS's GLM procedures (SAS Institute, Inc. Cary, NC).

The percent brown-spot area was different (prob. > F = 0.0001) among the treatments (Table 1). Pots without KCl or K_2SO_4 had 8.1% of brown-spot. Pots with KCl addition had less brown-spot compared with the pots with K_2SO_4 application or the control. For example, there were 3.6% spot areas in the non-coated KCl in the 25 kg K ha^{-1} treatment compared with the 8.1% value with the control (LSD = 4.1%), but non-coated K_2SO_4 produced little difference compared to the control. KCl at 25 kg K ha^{-1} in non-coated and coated treatments had less spot area, compared to K_2SO_4 with non-coated and coated treatments (contrast = 0.0001). Comparing the KCl treatments, the higher application rate had less leaf spot area. The average area for the KCl at 25 kg K ha^{-1} was 3.9% compared with 1.1% of KCl

Table 1. Percent leaf area covered by physiologic leaf spots

Treatment	Coating	Rate of K application (kg K ha^{-1})	Leaf area covered by the spots (%)
Nil		0	8.1
K_2SO_4	No	25	7.6
K_2SO_4	Coated I[zy]	25	6.3
K_2SO_4	Coated II[x]	25	13.7
KCl	No	25	3.6
KCl	Coated I[z]	25	1.1
KCl	Coated II[x]	25	6.9
KCl	No	75	0.3
KCl	Coated I[z]	75	1.2
KCl	Coated II[x]	75	1.9
LSD 0.05			4.1
Probability > *F*			0.0001
Contrasts			
KCl at 25 vs. K_2SO_4 at 25			0.0003
KCl at 25 vs. KCl at 75			0.0278

[z]Thin coating.
[y]This treatment was based on two replicates only.
[x]Thick coating.

at 75 kg K ha^{-1} (contrast = 0.0278). Considering application of KCl at 25 kg K ha^{-1}, coated I had less coating than coated II and consequently there was more brown-spot with coated II than coated I (LSD = 4.1%). However, when KCl was applied at 75 kg K ha^{-1}, there were fewer brown-spots for the coated I and coated II. Similarly with K_2SO_4, the Coated II had a larger spot area (13.7%) than the coated I or non-coated K_2SO_4 (LSD = 4.1%).

Powelson and Jackson (1978) concluded that Cl^- containing fertilizers reduced take-all root rot in wheat. Engle (1995) found that leaf spot occurred in winter wheat relative to Cl in leaves in some cultivars. Other researchers (Cunfer et al. 1980; Temiz 1976) showed that increasing K^+ suppressed wheat glume blotch and leaf blotch. In our experiment, we used KCl and K_2SO_4 fertilizers with barley (cv. Duke). Our results of the percent leaf areas of K_2SO_4 and KCl treatments indicated that Cl^- was more likely playing a role in reducing the physiologic leaf spot. However, it is not known if leaf spot in other cultivars of barley is affected by fertilizer KCl.

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