**Setaria digitata** in Cattle of Thailand Identified by Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis

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(Received 5 October 1998/Accepted 29 November 1998)

**ABSTRACT.** Adult Thai *Setaria* worms collected from cattle which were bred, housed and slaughtered in Thailand were morphologically identified as *Setaria digitata*. Furthermore, in sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) adult Thai *S. digitata* had the same protein profiles as adult Japanese *S. digitata*, but did not possess the protein with a molecular size of 69 kDa which was confirmed in adult *S. marshalli*. In addition, there were no differences in the protein profiles between male and female *S. digitata*. In point of the distribution pattern of the proteins ranging from 73 to 64 kDa revealed by 2D-PAGE, there were no differences between Thai and Japanese *S. digitata*, and between male and female worms of the species.—**KEY WORDS**: SDS-PAGE, *Setaria*, Thai.


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*Setaria digitata* and *S. marshalli* normally parasitize the peritoneal cavity of cattle. Another *Setaria* species, *S. labiatopapillosa*, has been also found in adult cattle. There are some morphological differences in the anterior and posterior part of body among *Setaria* species, by which the genus *Setaria* can be classified morphologically into species. Recently, we reported that *S. digitata* could be differentiated from *S. marshalli* by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and there were no sex differences in electrophoretic patterns of these two species [2]. *S. marshalli* possesses 69 kDa protein but *S. digitata* does not. This fact may indicate that the technique is useful for identification of adult worms of the two species. In general, it is difficult to distinguish adult male of *S. digitata* from that of *S. marshalli* by morphological characteristics without specialist skills. Furthermore, there were no reports on the classification of *Setaria* worms in Thailand using SDS-PAGE technique. In order to prove the usefulness of our technique, we attempted to classify adult Thai *Setaria* worms into species using our new technique after they were morphologically identified.

Fifty-five adult Thai *Setaria* worms were obtained from cattle which were bred, housed and slaughtered in Nonthaburi Province in Thailand. On the other hand, adult Japanese *Setaria* worms were collected from the peritoneal cavity of slaughtered calves and cattle in Ibaraki prefecture. All of the worms were morphologically classified into *S. digitata* and *S. marshalli* by the previously described morphological features [1] as follows: adult male *S. digitata* has 3 pairs of precloacal, one pair of adcloacal and 3 pairs of postcloacal papillae while adult male *S. marshalli* has 4 pairs of precloacal and 3 pairs of postcloacal papillae together with 3 lateral papillae. Furthermore, the posterior end of adult female *S. digitata* was pointed with a knob at

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the tip of tail while the tip of posterior part of adult female *S. marshalli* was blunt with small spines. In contrast to those *Setaria* species, adult male *S. labiatopapillosa* has 4 pairs of postcloacal papillae and the adult female has the blunt tip of tail with spines [1]. Therefore, *S. digitata* and *S. marshalli* are different from the other *Setaria* species in the morphological features. The biochemical classification of *Setaria* worms obtained in Thailand were carried out using SDS-PAGE and 2D-PAGE according to Subhachalat and Adachi [2].

As the results, adult Thai *Setaria* worms were morphologically identical with adult Japanese *S. digitata*. Both male and female Thai *S. digitata* had the peribuccal chitinous ring with lateral epaulet-like structures which was shown by Whitlock [3] (Fig. 1a and 1c), and papillar arrangement consisting of 3 pairs of precloacal, one pair of adcloacal and 3 pairs of postcloacal papillae was found in the posterior part of male worms (Fig. 1b) while the sharply attenuated tail end with a knob at the tip was found in female worms (Fig. 1d). In SDS-PAGE analyses, the protein profiles of adult Thai *S. digitata* were identical with those of adult Japanese *S. digitata*, but differed from those of adult Japanese *S. marshalli* (Fig. 2). The 69 kDa protein was confirmed neither in male nor female *S. digitata* although adult Japanese *S. marshalli* possessed 69 kDa protein in the male and female worms [2] and there were no differences in the protein profiles between adult Thai and

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Fig. 2. Comparison of protein profiles among Japanese *S. marshalli*, Japanese *S. digitata* and Thai *S. digitata* by SDS-PAGE. Lanes: a, adult male worms; b, adult female worms; 1, Japanese *S. marshalli*; 2, Japanese *S. digitata*; 3, Thai *S. digitata*. Arrow shows the major protein bands among these worms. Molecular size markers are indicated on the left (kilodaltons).

Fig. 3. Comparison of the protein distribution by 2D-PAGE between Japanese and Thai *S. digitata*. a, adult male Japanese *S. digitata*; b, adult male Thai *S. digitata*; c, adult female Japanese *S. digitata*; d, adult female Thai *S. digitata*. Arrows show the protein spots in the worm ranging from 73 to 64 kDa. Molecular size markers (M) are indicated on the left (kilodaltons). The gels and the diagrams have the basic end to the right and the acidic end to the left.
Japanese *S. digitata*. In 2D-PAGE analyses, a large cluster of protein spots ranging from 73 to 64 kDa was observed in both adult Thai and Japanese *S. digitata*, and the distribution pattern of the protein spots was quite similar between adult Thai and Japanese *S. digitata* (Fig. 3) but no sex differences were found in the pattern.

In this study, adult Thai *Setaria* worms collected from cattle which were bred and housed in Thailand were identified as *S. digitata* using the morphological features and biochemical properties analyzed using SDS-PAGE and 2D-PAGE. However, we could not find any other *Setaria* species morphologically different from *S. digitata* and *S. marshalli*. We could compared these 2 species of *Setaria* morphologically and biochemically. This is the first report on the presence of *S. digitata* in cattle in Thailand. Further experiments may be necessary to compare the biochemical properties among other *Setaria* species than *S. digitata* and *S. marshalli*.

ACKNOWLEDGMENTS. The authors wish to thank Dr. S. Yongsiri and Dr. T. Kositamongkol of the Department of Veterinary Pathology, Faculty of Veterinary Science, Chulalongkorn University, Thailand for useful help.

REFERENCES