Taioba (Xanthosoma sagittifolium) is an edible aroid originated from tropical America that exhibits significant nutritive value. Its tuberous portions are consumed by several populations worldwide and can be an important source of subsistence energy in these regions; the leafy portions, however, are generally discarded perhaps because is not regarded as a conventional vegetable. The objectives of this work were to determine and characterize the dietary fiber present in Taioba Leaf Powder (TLP), and to examine its possible prebiotic effect when fed to rats. The leafy portions of the plant were cooked, freeze-dried and the dietary fiber content determined both quantitative and qualitatively. Biological evaluation was conducted to assess the effect of TLP on the intestinal short-chain fatty acid production, known to be an indicator of prebiotic function. Total, soluble and insoluble dietary fiber contents in TLP were 35.23 ± 0.26%, 6.82 ± 0.06% and 28.04 ± 0.21%, respectively. Monosaccharide composition showed glucose and fructose as the main components (61% and 29%, respectively) and total neutral sugars constituted 19.29 ± 2.0% of the TLP. Animals fed with diets containing the leaf powder (2.5% cellulose and 2.5% TLP) showed the highest fermentative rate in the colon. The same animals showed that butyric acid also had the highest concentrations in comparison to the other acids. In the cecum contents of these animals, great fermentative rates were also observed. The present study suggests that dietary fiber and/or other bioactive compounds in the TLP could beneficially influence fermentative rate and short-chain fatty acid profile.