Microwave irradiation enhances the rate of transmethylation of fatty acids in rice bran oil catalyzed by sodium methoxide (1 or 0.3%). The reaction is completed in 40 s in methanol–toluene (1:10, v/v) and in 15 s in methanol–toluene (1:3, v/v). A high concentration of methanol in the mixture raises the temperature rapidly and results in a fast transmethylation. This method gives a yield of fatty acid methyl esters comparable to, or higher than, the traditional preparation and the conditions are mild enough for analysis of oils rich in polyunsaturated fatty acids. The method can rapidly process multiple samples and can be easily applied to the determination of the fatty acid compositions of vegetable oils. The advantages of this new method are its speed, and the accurate results which are comparable to the conventional technique.