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ABSTRACT

This study presents the joint use of magnetic nanoparticles (MNPs) and gold nanoparticles (GNPs) for double enhancement in a lateral flow immunoassay (LFIA). The study realizes two types of enhancement: (1) increasing the concentration of analytes in the samples using conjugates of MNPs with specific antibodies and (2) increasing the visibility of the label through MNP aggregation caused by GNPs. The proposed strategy was implemented using a LFIA for potato virus X (PVX), a significant potato pathogen. MNPs conjugated with biotinylated antibodies specific to PVX and GNPs conjugated with streptavidin were synthesized and characterized. The LFIAs with and without the proposed enhancements were compared. The double-enhanced LFIA achieved the highest sensitivity, equal to 0.25 ng mL^{-1} and 32 times more sensitivity than the non-enhanced LFIA (detection limit: 8 ng mL^{-1}). LFIAs using one of the types of amplification (magnetic concentration without GNPs-causing aggregation or MNP aggregation without the concentration stage) showed intermediate levels of sensitivity. The double-enhanced LFIA was successfully used for PVX detection in potato leaves. The results for