Abstract: This study was conducted to fortify nutritional and chemical composition of sunflower meal (SFM) and full-fat soybean (FFSB) used as a protein source in farm animal nutrition by Bacillus subtilis ATCC 6633 fermentation. An optimized set of fermentation parameters (60% moisture, 6.5–7.0 pH, 30–35 °C temperature, continuous aeration of 0.5–1.0 L/min and agitation of 20–100 rpm) were used to ferment SFM and FFSB samples with or without using bacterial inoculant for 0, 24, 48, and 72 h. The results indicated that the total organic acids (TOA) contents and crude ash (CA) of SFM and FFSB increased significantly, but there were significant reductions in dietary fiber (DF) components (acid detergent fiber (ADF) and neutral detergent fiber (NDF)) in both feed samples. Moreover, urease activity, trypsin inhibitors (TI), and phytic acid (PA) contents of both feed samples reduced by 50%, 35%, and 79%, respectively. Total flavonoid level reduced by 30% in FFSB samples, but remained unchanged in SFM samples. The levels of tannin in FFSB and SFM decreased significantly. Although there were no significant changes in the activities of amylase, celulase, and beta-glucanase; the protease and phytase activities increased significantly. The total phenolic compounds content and the antioxidant activities of FFSB and SFM samples increased significantly. In conclusion, the fermented FFSB (F-FFSB) and fermented SFM (FSFM) had lowered the levels of ADF, NDF, tannin, TI, urease activity, and PA but they were remarkably enriched with organic acids, enzymes, and antioxidants. These feed materials could be used as functional feed additives or feed materials in farm animal nutrition.