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Summary report for the period from April, 1964 to
termination of project, July 31, 1965

Microbiological deterioration of stored grains.- Soybeans stored with moisture contents of 12.5 to 14.0% and at 25°C were invaded by storage fungi within 6 months to a year, and the increases in fat acidity values were approximately proportional to the degree of invasion by fungi. The present moisture content limits specified by the U.S. Standards for No. 1 (13.0%) and No. 2 (14.0%) soybeans appear to be too high. One of the approved methods of determining moisture content of soybeans by oven drying (i.e. drying at 105°C for 12 hours) consistently gives moisture content figures lower than those obtained by the 2-stage air, oven method. A manuscript concerning invasion of stored soybeans by fungi has been submitted for publication in Phytopathology, and has been accepted.

Moisture content limits for invasion of various kinds of grains and seeds by Aspergillus flavus have been determined; in general these are moisture contents in equilibrium with a relative humidity of 85%. Individual seeds or kernels of peanuts exposed to a relative humidity of 85% and allowed to come to equilibrium moisture content, have moisture contents of 8.3 to 11.8%; the present specification of a moisture content of approximately 9.0% for peanuts, which aims to avoid invasion of the seeds by A. flavus, may permit invasion of some of the

seeds by this fungus. It is expected that a thesis for the PhD degree will be completed within the next few months by L. C. Lopez F. from this work.

Toxicity to animals of grains and feeds invaded by fungi.- Approximately 400 isolates of 10 genera of filamentous fungi and yeasts, from grain and from feed on farms where illness or death not attributable to known causes had occurred in flocks or herds of domestic animals, were grown in autoclaved moist corn and fed to rats and to swine. Twenty seven of 75 isolates of Fusarium caused marked enlargement of uteri of rats within 7 days, caused vulvular hypertrophy of immature swine in 6 days, and prolapsed vagina and greatly enlarged uterus in an immature gilt in 18 days. Some isolates of Fusarium caused death, within 4 to 6 days, of rats to which they were fed, with increases of 10X in weight of uteri. About 50% of the isolates of the fungi other than Fusarium caused death, within 4 to 10 days, of the rats to which they were fed. Symptoms of necropsied rats that died when fed corn inoculated with Alternaria, Aspergillus flavus, A. niger, Chaetomium, Cladosporium, Nigrospora, and Penicillium included subdural hemorraging, massive hemorrhagic enteritis, and hemoglobinuria; in many cases, the symptoms before death indicated damage to the central nervous system. The compound produced by Fusarium which resulted in the extrogenic syndrome in rats and in swine was extracted, purified, and found to have ultraviolet absorption maxima at 314, 274, and 236 mμ. Corn invaded by Chaetomium that was lethal to rats within 4-5 days, when fed as their sole ration, produced no detectable symptoms in swine when fed as 50% of their ration for 6 weeks. Work is under way on the isolation, purification, and identification of toxins produced by Chaetomium and by Penicillium. Production of toxins by fungi is influenced by the strain or isolate of the fungus, by the material in which it is grown, and by the temperature or temperatures and length of time at which it is incubated; a fungus that is lethal to rats may be relatively harmless to swine.