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学 術 報 告 抄 録

Seed Abortion and Techniques for Obtaining Hybrids in Interspecific Crosses of *Cucurbita*

（カボチャの種間交配における種子の発育不全と雑種植物作出技術）

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栽培カボチャの自殖と種間交配を行い，種子の発育について調査した。種間交配では，胚乳の生長は自殖の場合に似ていたが，胚の生長は自殖よりも劣った。正常な受精後の胚の生長にみられる自殖と種間交配との違いは，胚と胚乳の和合性の差異にもとづくものと思われる。

同じ組合せの種間交配でも，親の品種により種子の発育に大きな違いを生じた。種間交雑の成功には，品種間差異がある。

5～6㎜の自殖胚の胚培養には，無機成分1/2濃度・有機成分標準・シュクロス 5g/l のMS培地が適していた。この培地は1～2㎜の種間交雑胚の培養にも適用できる。

親品種の選択と胚培養技術を活用することで，カボチャの種間雑種を効率よく作出できる。

Farm Engine—Transmission Control System and Operation Method in Harvesting for Fuel Saving

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High Efficient Utilization of Energy concering to Bio-resource（エネルギー特別研究英文報告書），1987，23－28.

Energy saving science in agriculture has to be composed of not only rational farm working with machines but also a rational engine and transmission system of the machine and the equipment mounted on it. Firstly, "operation and load modes" were analyzed for typical patterns of paddy harvesting with a combine harvester. Total operating time and fuel consumption for each pattern could be predicted by derived equations based on the modes. "Futile-consumption ratio", the ratio of total fuel consumption of futile working modes to that of all working modes is useful to evaluate the operation method in a field. Secondly, an optimum control system of a power-transmission-equipment system with computer was developed for fuel saving. The systems controlling engine speed and reduction ratio of the power transmission realized the lowest specific fuel consumption of an engine.

The results obtained in this study are summarized as follows:

1. In order to analyze working time and energy input, "load mode" was proposed in addition to conventional "operation mode" of a machine in farm fields.

2. Operation and load modes of paddy harvesting were analyzed. Delta type turning for a rectangular turn, minimum U type and delta type turning for a full turn were recommended because of lower fuel consumption, shorter operation time and easier operation. Prediction of total working time and fuel consumption for paddy harvesting is possible by using analytical equations based on the operation and load modes.

3. Fuel consumption efficiency for operation methods could be estimated by using

futile-consumption ratio, and then the best operation method of harvesting for each rectangular shape field could be determined from the viewpoint of fuel saving.

4. The concept and the utility of the optimum control system for the engine speed and transmission reduction ratio was proposed, and an experimental system consisting of an engine, a variable-speed transmission, a dynamometer, measuring equipment and a computer system, etc. was developed to realize the optimum control.

5. The software for the multi-purpose control system was developed. The iso-specific fuel consumption curves and the optimum operation curve of an engine were proposed using the software.

6. According to the results, about 10 to 30 percent of fuel consumption could be saved as compared to that of an ordinary tractor with equipment without the control system. Moreover, fuel consumption in the field could be saved by adopting an optimum operation method of farm work.

Optimization and Energy Saving in Agricultural Machinery Operating System

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Conventional operation modes consisting of time, field shape, machine size and speed, etc. is insufficient to estimate input energy, operation method and operation system of agricultural mechanization. It is necessary to adopt the concept of "operation and load modes" of farm work and machine performance on system analysis studies.

A tractor with an equipment could be operated within the lowest fuel consumption range of the engine through controlling the engine speed and the shifting ratio of the transmission system in respect to saving energy input, even if the load modes are the same. The fuel consumption characteristics of a machine system which consisted of a farm power, power transmission with shifting mechanism was analyzed as the whole system from an energy saving viewpoint. The optimum procedure and method in the system were discussed.

The results obtained in this study are summarized as follows:

1. The principle and the utility of the control system for the engine speed and transmission reduction ratio to maintain the engine power required by farm work was proposed.

2. An experimental system consisting of an engine, a variable－speed transmission, a dynamometer, measuring equipments and a computer system, etc. was developed to prove the optimum control principle.

3. The "optimum operation curve" of an engine was proposed. The curve was obtained by computer analysis.

4. The characteristic curve of "engine power and specific fuel consumption" of

the optimum operation curve was proposed to express the performance of minimized fuel consumption of the engine. The curve will present a new criterion for fuel saving engine design.

5. It was concluded that about 10 to 30 percent of fuel consumption could be saved as compared to that of an ordinary tractor with an equipment without using the control system.