An Automated System for Dispensing Fly Food into *Drosophila* Vials

Application Note

Introduction

The vinegar fly, or fruit fly (*Drosophila melanogaster,* **Figure 1***)* is an excellent animal model for studying the underlying mechanisms of human disease. The fruit fly was one of the first organisms ever used for genetic research over 100 years ago, and is the most well-known of all eukaryotic systems even today. *Drosophila* are used in a variety of fields including the study of aging, immunity, diabetes, cancer, autism, birth defects, sleep disorders, and neurodegenerative diseases.

Drosophila research remains at the forefront of medical studies due partially to the fact that humans and fruit flies are quite similar at the molecular level. Around 75% of known human disease genes have a recognizable match in the genetic code of *Drosophila melanogaster* (Reiter, et al., 2001), and 50% of fly protein sequences have mammalian analogs.

Figure 1. *Drosophila melanogaster* close up (left) and in a laboratory setting (right)

There are several advantages to using fruit flies over other animal models such as rodents. With *Drosophila melanogaster,* one can begin with a list of genes active in the egg and follow the morphological changes and gene activation through adulthood (Brody, 1995). Fruit flies are easy to handle, small in size, and have a short life-cycle, allowing the researcher to quickly evolve many generations in a short time. They are also relatively inexpensive and easy to keep in large numbers, which helps with meeting the high demand from research markets.

Gilson, Inc.
Middleton, WI 53562 USA
Telephone: 800-445-7661

In preparation for use in research studies, *Drosophila* larvae must eat and grow continuously over a four-day period before hatching. Large amounts of fly food must be prepared and dispensed into culture tubes or other vessels -- a process which can be time consuming and labor intensive. This application note describes the use of an automated instrument to alleviate this bottleneck.

Methods and Materials

Fly food is a gel at room temperature. When heated to 65 ºC it becomes a liquid with the consistency of thin oatmeal which can be dispensed into tubes or vials. There are several ways to make Fly Food, and a typical recipe is shown in **Table 1** below.

Ingredient	Quantity
Water	57,200 mL
Agar	355 g
Molasses	4700 mL
Corn Meal	3,840 g
Yeast	510 g
Proprionic Acid	745 g

Table 1: Example Fly Food Recipe (Yale School of Medicine, New Haven, CT)

Propionic acid is added as an antifungal agent. There are alternative formulas which utilize the commercial anti-fungal agent known as Tegosept (contains methyl paraben).

These ingredients are mixed in a large heated pot with a large stainless steel stirrer (**Figure 2**). The fungicidal agent is added last after the solution has cooled to prevent any heat inactivation. The solution is then ready to dispense into appropriate vessels.

Figure 2. Heated pot with stirrer for making fruit fly larva food

Automated Workflow

Automatic fly food dispensing is accomplished using the Automated Fly Food Dispenser from Gilson (**Figure 3**). A user loads the *Drosophila* vials of choice onto the system, and the software automatically positions a multi-channel dispensing head just over the top of the vial. Fly food is delivered by pump to quickly and efficiently fill the entire tray. The pot shown in **Figure 2** serves as the reservoir from which the heated fly food is pumped, and a customized tubing sinker is included with the system which holds the inlet line down inside the reservoir.

After the system finishes dispensing the fly food is allowed to cool. The user then adds the fly larvae and seals the vials.

The system is compatible with most common vial sizes, and may be further customized to meet any unique user requirements.

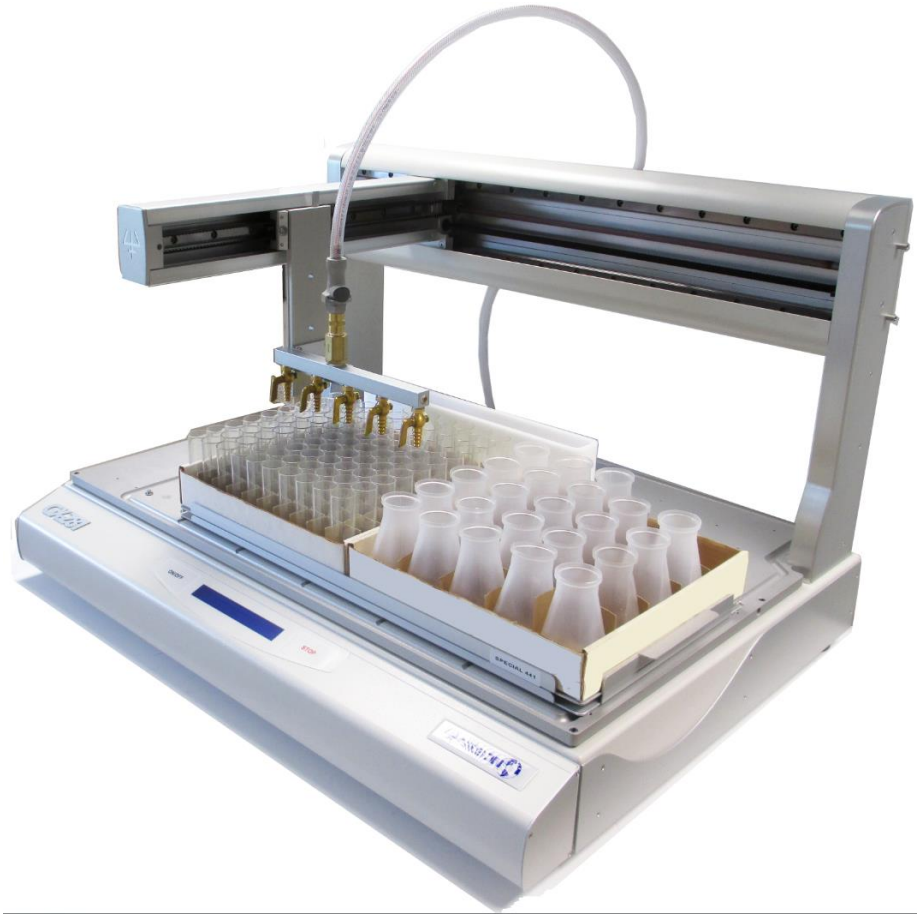

Figure 3. Automated Fly Food Dispenser from Gilson

Gilson offers the Automated Fly Food Dispenser with a Watson Marlow 620 DI Pump with 625L pump head (**Figure 4**). Typical flow rate for the setup is around 1.4 L/min. While this configuration is recommended, it is also possible to work with other pumps as preferred by the end user. This may require some modifications to the software.

Figure 4. Watson Marlow 620 DI Pump with 625L head

The system is controlled via laptop or PC with a special software program (**Figure 5**). The program is currently available for Windows® XP and Windows 7 Operating Systems.

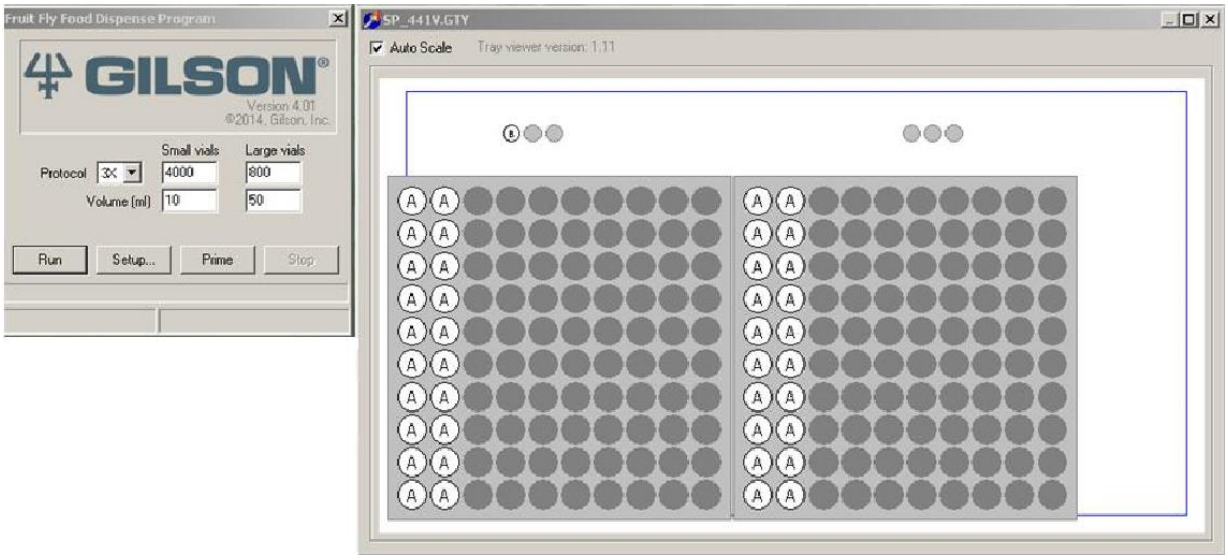

Figure 5. Software program to control the Automated Fly Food Dispenser

Related Part Numbers

	Part Number	Description
Base Unit (required line items)	261036	GX-281 LH, NO PUMP, NO Z-ARM
	SPL-2236A-CSP	PUMP, PERISTALTIC FLY FOOD WATSON MARLOW
	21100002	COMPUTER, DESKTOP, WIN7 W/DVD 22" FLAT PNL
	SPL-1820-SFW	GILSON SERVER FOR WINDOWS® XP AND WINDOWS 7
	SPL-2236C-SFW	PROGRAM, GX-281 FLY FOOD W/ WATSON MARLOW PUMP
	SPL-2236E-HDW	INLET LINE SINKER TO HOLD PUMP INLET LINE IN MEDIA RESERVOIR
	SPL-2236B-HDW	BRKT, GX-281 Z-ARM TO HOLD FLY FOOD DISPENSE HEAD
	SPL-2236D-HDW	DRAIN, FOR GX-281 FLY FOOD DISPENSE HEAD
	36083132	NULL MODEM ADAPTER, DB9M DB9F
	36083129	SERIAL CABLE, D9PIN MALE TO D9PIN FEMALE
	36083122	SERIAL CABLE, 9-PIN TO 25 PIN
	SPL-2112A-CSP	CONVERTER, USB TO SERIAL 4 PORT ADAPTER
Racks and Adapters (choose one)	SPL-2236M-HDW	GX-281 adapter to mount two of customer's cardboard tube racks for use with SPL-2236H-HDW. Head spacing is compatible with 29.5mm (vials) or 58.6mm (bottles). Formerly known as Special 441.
	SPL-2236N-HDW	GX-281 adapter required in order to mount two cardboard tube racks on the SPL-2236M-HDW adapter. Compatible with SPL-2236G-HDW dispense head where spacing is 25mm (vials) or 50mm (bottles). Can also use SPL-2236F-HDW dispense head when working with the 25mm vials. Formerly known as Special 466.
	SPL-2236P-HDW	Adapter to hold a wire basket for fly food flasks. Spacing is 58.6mm. Compatible with SPL-2236H-HDW dispense head. Formerly known as Special 1553.
	SPL-2236Q-HDW	Rack adapter for the GX-281 Fly Food Robot to hold 6X6 bottle boxes (use SPL-2236L-HDW) and 10X10 vial boxes (use SPL-2236J-HDW). Spacing is 30.48mm (vials) or 50.5mm (bottles). Formerly known as Special 1765.
	SPL-2236R-HDW	GX-281 rack to hold 5X10 array of customer's bottles. Compatible with the SPL-2236K-HDW dispense head. Spacing is 63.25mm. Formerly known as Special 629.
Dispensing Heads (choose one)	SPL-2236F-HDW	10-channel dispensing head for the GX-281. Uses the same 25 mm spacing as the SPL-2236N-HDW rack. Replaces former Special 628.
	SPL-2236G-HDW	5-channel dispensing head for the GX-281. Heads are spaced 50.0mm apart. Compatible with SPL-2236N-HDW rack. Replaces former Special 481.
	SPL-2236H-HDW	5-channel dispensing head for the GX-281. Heads are spaced 58.6mm apart. Compatible with SPL-2236M-HDW rack. Formerly known as Special 480.
	SPL-2236J-HDW	5-channel dispensing head for the GX-281. Heads are spaced 61.0mm apart. Compatible with SPL-2236Q-HDW racks. Formerly known as Special 1764.
	SPL-2236K-HDW	5-channel dispensing head for the GX-281. Heads are spaced 63.3mm apart. Compatible with SPL-2236R-HDW racks. Formerly known as Special 630.
	SPL-2236L-HDW	6-channel dispensing head for the GX-281. Heads are spaced 50.8mm apart. Compatible with SPL-2236Q-HDW rack. Formerly known as Special 1763.

Conclusion

This article describes a fast and effective automated method for filling vials and/or culture tubes with fly food in order to grow large numbers of *Drosophila melanogaster.*

References

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