

特許出願中

驚異のパワー

収穫力

農産物・植物の液体活力剤

1L

土壌活性化剤「収穫力」は海の魚・海藻を原料とし、有効バクテリア・酵素で発酵分解して製造され、ビタミン、ミネラル、各種アミノ酸を多く含んでいますので水通水で希釈して何度か散布すると土壌バランスが良くなり、固結した土壌は団粒化して柔らかくなるので作物の根は良く伸び、土壌内の酸素量は増え、通気・通水が良くなります。更に、人間にも地球にも優しく安全無害です。

SHUKAKU RIKI

**Fusarium OXYSPORUM CUBENSI SP. (FOC) panama
diseased using shukaku riki as bio fertilizer/microbial
inoculant PROTOCOL**

SIT SITE SELECTIONS

The site must be sporadically infected by Panama disease as base on ocular assessment and disease report submitted. That is also suitable for rehabilitation purposes to new set of planting using the plantlets or tissue seedlings where in SHUKAKU RIKI Bio fertilizer to be used for Panama disease control agents.

TYPE OF PHASES TREATMENT FOR CAVENDISH BANANA PLANTATION

1. **At Planting** - Re entry of area under rehabilitation scheme as totally infected by Panama Disease.
2. **Established area** – Sporadic Panama disease infestation in certain area.

PROCEDURES

SHUKAKU RIKI is a liquid form of Bio fertilizer that easily incorporate during preparation. Recommended Mixing rate for Panama Disease treatment require at 10 ml-20 ml pure **SHUKAKU RIKI** solution in every 1 liter of water.

Delivery of prepared solutions requires rate ml/liters per case/plant in every treatment application depending on application methods (Please see recommended rate tabulation below).

APPLICATIONS

Application methods are two ways: drenching and soil injection methods.

In drenching – Using plastic sprinkler can fill it with desired volume of mix solution and pour around the base of the case/plant at least 60 centimeter or 2 feet radius. The solutions evenly spread completely covered the entire space and pseudo stems of case plant (**Established area**). And (**at Planting**) the prepared mix solutions must applied into the hole prior planting material put in place. At the rate of 10 ml / 1-liter water at the delivery of 1-liter solution per hole as basal approach. Proceed to the next sample plant and repeat the procedure until all cases/plant sample completed. And note that Drenching application done at once during the first treatment only.

Please note: Agitate constantly the solution prior to or before applied every case/plant. Mixed solution must not leave at open space under direct sunlight.

Soil injection – For established area. Fill the can /container of mix solutions and proceed to target case/plant. Three to four sites depending on size of the case plant where to inject the solution at equidistance @ 2 feet around the base of case plant. Point the injector needle @ 10 o'clock position insert on to the soil push until reach at required depth. Reverse a little bit to provide enough space prior the release of solutions inside the whole by open the trigger of the pressure spray can. Release 100 ml per sites at the rate of 20 ml of pure solution per liter of water. Repeat the procedure every after the case completed. Also note the area must underway soil PH reading or testing using standard unit/device. This is conformity in compliance to address the soil improvement and physical changes after treatment made.

At planting - The mix solutions (SHUKAKU RIKI) at recommended rate as mention above must applied at planting activity. Prepared solutions applied as basal at desired holes prior the planting material put in place.

Established area – The mix solutions (SHUKAKU RIKI) at recommended rate as mention above must applied at desired area where Panama Disease severely infected the area. Refer to disease assessment report and protocol established.

NUTRITIONAL APPROACH - We strongly considered and as recommended SHUKAKU RIKI as Bio Fertilizer and as soil activator. In this event, this approach is vital basis for nutrient supplemental and aims to reduce the use of synthetic (Fertilizer) at 50 % in total cropping requirement (fertilizer. Program). This will ease / reduce the material cost in Cavendish Banana Farm respectively.

PATHOLOGICAL APPROACH - The presence Bio organism as major component of Shukaku Riki become the inhibitor to all types soil borne diseases. This essential organisms provide a broad expectrum to protect the plant from any attack such as soilborne diseases during early growth or even on the matured age of the plant.

MIXING PROCEDURES

Prepare empty containers @ 60 liters volume capacity where pure solutions and water can be mix. At the recommended rate mention above. There should be enough empty containers for convenient rotations and distribution of stocks solution during treatment activities. Always required to conduct a water PH analysis in every water solution used to determine if the water source has a good PH level as for reference during the actual mixing made.

Calibrate the pure solutions in accordance with the above mention recommendation rate and properly mix into prepare empty container that filled with water. Please note always agitate thoroughly the pure solution prior or before mixing or incorporate in prepared water in the container and same with the prepare solutions must also agitate as well before in every application made. Apply the prepare solutions on the desired area of plants/cases.

Please refrain from using of chlorinated water as mixing solutions for us to avoid unnecessary problem when it regards to Bio organism performance. This may disintegrate their structural /physical formation as they are in a form of cell structures. But nevertheless, they can stand /tolerate chemical toxicities as unique family of bacteria that had especial characteristics among bacterial species in nature.

Containers where pure solutions inside must keep in cool and safe place and avoid excessive expose in open sunlight. Must keep the cover cap close tightly before and after used.

TABLE 1. SHUKAKU RIKI TABULATION TREATMENT PANAMA DISEASE PRESENTATION GUIDE

PHASE/TYPE	METHOD/APPLICATION	TREATMENT	RATE ML/WATER	DAYS GAP	DELIVERY OF SOLUTION	NUMBER OF INJECTION SITES/CASE
AT PLANTING	DRENCHING	BIO ORGANISM/FERTILIZER /SOIL ACTIVATOR/INHIBITOR	10 ML/SHUKAKU RIKI	0	0.5-1.0 LITER SOLUTION/HILL	0
ESTABLISH AREA NON- INFECTED/MAINT ENANCE	DRENCHING	BIO ORGANISM/FERTILIZER /SOIL ACTIVATOR/INHIBITOR	10 ML/SHUKAKU RIKI	30	2 LITERS SOLUTION/CASE PLANT	0
ESTABLISH AREA INFECTED CASE TREATMENT	DRENCHING	BIO ORGANISM/FERTILIZER SOIL ACTIVATOR/INHIBITOR	20 ML/SHUKAKU RIKI	Only ONCE/ at first application required	2 LITERS SOLUTION/CASE PLANT	0
ESTABLISH AREA	SOIL INJECTION	BIO ORGANISM/FERTILIZER /SOIL ACTIVATOR	20 ML/SHUKAKU RIKI	30	100ML/SITES/HOLE/ CASE/PLANT	3-4

PEST AND DISEASE MANAGEMENT

A. PEST AND DISEASE MONITORING

1. Early monitoring or identifying the common Pests and Diseases of rice could make a big help to control the spread and becoming major constrain in the end.
2. Proper timing application of such control also contribute of good effect to minimize the infestation.

DATA GATHERING

A. AGRONOMIC DATA (Nutritional data)

1. Plant Height
 - ❖ From planting to shooting
- 2.. Leaf emergence
 - ❖ At least 1 meter in height of young plant up to shooting
3. Functional leaves
 - ❖ From sucker to shooting
 - ❖ From shooting to harvest
4. Total average no. of days
 - ❖ From sucker to shooting stage
 - ❖ From shooting to harvest (days hanging)
5. Bunch weight
 - ❖ 1_{st} Hand, 2_{nd} hand and 3_{rd} hand
6. Finger length
 - ❖ 1_{st} Hand, 2_{nd} hand and 3_{rd} hand
7. Calibration at harvest
 - ❖ 3_{rd} Hand and at the center/middle finger

B. PATHOLOGICAL DATA TO BE GATHERED

1. Percentage (%) incidence of Fusarium wilt from 4 weeks to 77 weeks for comparative treatment performance and Bio efficacy of SHUKAKU RIKI as Biological control.
2. Severity reading of Panama disease incidence at younger plants up to shooting as for Bio efficacy of SHUKAKU RIKI on weekly basis data collection.

Here under severity of disease scaling for Fusarium oxysporum cubensi or Panama disease as follows:

- 1 - Very early symptoms showing slight discoloration towards the midrib one leaf that start down from the older leaf.
- 2 - Early moderate symptoms showing one to two leaves fully mature with typical discoloration.
- 3 to 4 - Moderate to severe symptoms showing a dark yellowing at least two to three leaves and Fully mature with typical discoloration advancing to upper leaves.
- 5 - Severe symptoms for dark brown to distinct yellowing discoloration rapidly increasing the Diseased start from the older leaves down and moving upward increase rapidly the younger Leaves showing severe wilting eventually killed the plants.

Disease index will be further computed by using the formula below:

$$DI = \frac{0N_0 + N_1 + N_2 + N_3 + N_4 + N_5}{5H} \times 100$$

Where:

- N_0 = are the number of samples with the rating of 0,1,2,3, and 4 respectively
- N = is the total number of rated samples
- 5 = refers to the highest severity of infection

THE EFFICACY OF BIO INOCULANT WILL BE BASED ON THE FOLLOWING CRITERIA:

DI (%)	Efficacy of rating
0 -11	very effective
12-22	effective
23-33	less effective
33 -above	not effective

WHERE:

PARAMETERS

750.00 / UNIT PRICE PER
750.00 DIVIDED BY 1000 ML
0.75 MULTIPLY BY 10 ML
7.50 MULTIPLY BY 2000 ML
0.75 MULTIPLY BY 20 ML
15.00 PESOS OR 1 LITER SOL.
DIVIDED 300 ML/SITES

10 ML PURE SOLUTION
20 ML PURE SOLUTION
2 LITERS MIX SOLUTION
300 ML MIX SOLUTION
1 CYCLE APPLICATION

30 DAYS INTERVAL

- 1 LITER PURE SOLUTION
- 0.75 PESOS /ML PURE SOLUTION
- 7.50.00 PESOS PER 1 LITER MIX SOLUTION/DRENCHING
- 15.00 PESOS COST PER CASE DELIVERY@ DRENCHING
- 15.00 PESOS PER 1 LITER MIX SOLUTION/SOIL INJECTION
- 5.00 PESOS COST PER CASE DELIVERY/SOIL INJECT

- MIXING RATE FOR 1 LITER WATER (For drenching)
- MIXING RATE FOR 1 LITER WATER (For soil injection)
- DELIVERY RATE PER CASE/PLANT @ Drenching
- DELIVERY RATE PER CASE/PLANT/100 ML/SITE @ Soil injection/ 3 sites
- FOR DRENCHING AT RE ENTRY/REPLANTING AND STANDING CASES TREATED
- FOR SOIL INJECTION @ 3 MONTHS STRAIGHT

COMPARATIVE COST ANALYSIS OF PANAMA DISEASED CONTROL FOR BANANA CAVENDISH USING SHUKAKU RIKI (POWER HARVEST) AS MICROBIAL INOCULANT AND BIO FERTILIZER AS TO REDUCE 50 PERCENT (%) SYNTHETIC FERTILIZER AGAINST 100 PERCENT (%) STANDARD FERTILIZER FARM APPLICATION PROTOCOL.

TABLE 1. AT 50 PERCENT (%) RECOMMENDED RATE APPLICATION FOR SYNTHETIC FERTILLZER PLUS SHUKAKU RIKI AS BIO FERTILIZER COMBINATION APPLICATION AT 2,000 POPULATION UNIT/HAS.

TYPE/FERTILIZER	NO. SPLIT/ CYCLE /PERIOD /YEAR	RECOMMEND ED RATE/ GRMS/ML HILL	NO. OF BAGS/LITERS PERIOD/ YEAR/HAS	UNIT PRICE	AT 50 (%) PERCENT /NO. BAGS	TOTAL AMOUNT	COST PER HECTARE	COST OF MATERIAL/ PERIOD/YE AR/HAS.	REMARKS
MIX FERTILIZER	13	70 -90	41.6	1,000.00	20.8	20,800.00	20,800.00	1,600.00	Farm Fert. Program
SHUKAKU RIKI (Soil drenching)	1	10 ML	4 L	750.00	-	3,000.00	3,000.00	230.76	At disease % assume assessment /has. 200 case/has. /Soil drenching
SHUKAKU RIKI (Soil drenching)	1	5 ML	18 L	750.00	-	13,500.00	13,500.00	1,038.46	Assume Healthy Plant w/ P.U 1,800 less from infected plants/has.
SHUKAKU RIKI (Soil injection)	3	20 ML	1.33 L	750.00	-	997.50	2,992.50	230.19	Soil inject/has. 200 / assumed Standing cases. /Has.
SHUKAKU RIKI (Soil injection)	3	10 ML	6 L	750.00		4,500.00	13,500.00	1,038.46	100% Soil inject/has. Mat to mat at 1,800 /P. U/has.
					TOTAL	AMOUNT -	53,792.50	4,137.88	

TABLE 2. AT 100 PERCENT (%) RECOMMENDED RATE APPLICATION FOR SYNTHETIC FERTILLZER AT 2,000 POPULATION UNIT/HAS.

TYPE/FERTILIZER	NO. SPLIT/ CYCLE /PERIOD/Y EAR	RECOMMEND ED RATE/ GRMS/ML HILL	NO. OF BAGS/LITERS PERIOD/ YEAR/HAS	UNIT PRICE	AT 100 (%) PERCENT /NO. BAGS	TOTAL AMOUNT	COST PER HECTARE/ PERIOD/YEAR	COST OF MATERIAL/ PERIOD/YE AR/HAS	REMARKS
MIX FERTILIZER	13	70 -90	41.6	1,000.00	41.6	41,600.00	41,600.00	3,200.00	100% Fert. Application program applied.
					TOTAL	AMOUNT -	41,600.00	3,200.00	

TABLE 3. COMPARATIVE COST DATA ANALYSIS BETWEEN 100%) RECOMMENDED RATE APPLICATION FOR SYNTHETIC FERTILLZER AGAINTS USIING SHUKAKU RIKI (Soil drench/soil injection methods) PLUS 50 PERCENT RATE OF SYNTHETIC FERTILIZER PACAKAGE 2,000 POPULATION UNIT/HECTARE.

TYPE/FERTILI ZER	NO. SPLIT/ CYCLE /PERIOD/ YEAR	RECOMMEND ED RATE/ GRMS/ML /HILL	NO. OF BAGS/LITE RS PERIOD/ YEAR/HAS	UNIT PRICE	AT 100 (%) PERCENT /NO. BAGS	TOTAL AMOUNT	COST PER HECTARE	COST OF MATERIAL/PERI OD/YEAR/HAS	REMARKS
MIX FERTILIZER	13	70 -90	41.6	1,000.00	41.6	41,600.00	41,600.00	3,200.00	100% Fert. Application program applied.
SHUKAKU RIKI PLUS 50% SYNTHETIC FERT	4 13	5-20 ML 35 G-45 G	29.33 L 20.8 BAGS	750.00 1,000.00	20.1	32,992.50 20,800.00	53,792.50	4,137.88	Combined package of Shukaku Riki plus 50% synthetic fertilizer.
					COST DIFREENT TOTAL -	AMOUNT -	12,192.50	937.88	

FACTS:

PANAMA DISEASE ERADICATION (CONVENTIONAL PRACTICES)

BURNING

The actual costs of conventional eradication activity for Fusarium or Panama disease will be costly in per hectare basis as compare in using Bio control that eradication activity will be absence.
If the Panama cases reaches up to 10% or 200 cases up per hectare (assumed reported cases/has.) which means the required manpower to perform eradication activity would take 2.7 weeks or 16.2 days at 6 cases/manday if assume 2 manpower will be utilized to perform to do such.

In addition, the total cost per hectare basis will be 11,340.00 at 2 manpower at 350.00/daily rate alone plus excluded chemicals (Conventional Practices) as treatment such as; burning practices using rice hulls. And the costs of eradication materials will be estimated 80,000.00 direct cost at total amount of 91,340.00/hectare assumed 200 cases Panama Disease. The 20 total sacks requirement for rice hulls for 1 case in burning eradication with 4,000 bags at 20.00/sack an amounting to 80,000.00 cost of material.

HERBICIDE INJECTION

Another type of eradication is by simply using herbicide injection direct to Panama infected plants. The procedure also be costly and simply no inhibition/control of the diseased since it will just be killing the host but not the pathogens itself. If the required 200 cases/manday at 200 cases/has (Assumed cases of Panama D.). It took 1 day to complete and at the cost of 350.00/has. At the rate 350.00/daily rate manpower excluded the herbicide chemical used. Pure solution (Herbicide) requires 20 liters/200 cases Panama disease injection at 40 ml/1 liter water at 100 ml/site inject. Cost for herbicide amount to 9,000.00 add on 350.00 with total amount of 9,700.00.

TABLE 4 . COSTS ANALYSIS COMPARATIVE USING SHUKAKU RIKI BIO CONTROL AGAINTS CONVENTIONAL ERADICATION PRACTICES

TYPE/ PARTICULAR	TREATMENT/ METHODS	RECOMMENDED BAGS RICE HULL/RATE//ML HILL	DELIVERY SOLUTION/ML LITER/HILL	ASSUMED NO. CASES/INJECTED / DRENCH/BURN	TOTAL LITER SOLUTION/BAGS RICEHULLS	UNIT PRICE	AMOUNT/COST PER CASE/ HECTARE/ YEAR	REMARKS
SHUKAKU RIKI	SOIL INJECT/ DRENCHING	5-20 ML	300 ML-4 L	200	4.3 L	750.0 0	3,925.50	Total cost /has. Including manpower activity.
CONVENTIONAL ERADICATION	BURNING ERADICATION	20		200	4,000	20.00	91,340.00	Total cost /has. Including manpower activity.
CONVENTIONAL ERADICATION	HERBICIDE INJECTION	100 ml	100 ML	200	200	450.0 0	9,700.00	1 injection site/case/pl ant

TABLE 5. AT RE ENTRY/REPLANTING OF REHAB AREA 100 PERCENT (%) RECOMMENDED RATE APPLICATION FOR HOLE/ BASAL DRENCH AT 2,000 \ POPULATION UNIT PER HECTARE. (AT 0 AGE)

	NO. SPLIT/				DELIVERY			
--	------------	--	--	--	----------	--	--	--

TYPE/FERTILIZER/ AMMENDMENTS	CYCLE /PERIOD/YEAR	RECOMMENDED RATE/ML LITER	NO. OFLITERS PERIOD/ YEAR/HAS	UNIT PRICE	SOLUTION ML/LITER/ HILL	TOTAL AMOUNT	COST PER HECTARE/ PERIOD/YEAR	REMARKS
SHUKAKU RIKI	1	10 ML	10 L	7,500.00	500 ML	7,500.00	576.92	100% SHUKAKU RIKI ORGANIC fertilizer. /Microbial inoculant Application
				TOTAL	AMOUNT -	7,500.00		

TABLE 6. AT RE ENTRY/REPLANTING OF REHAB AREA 100 PERCENT (%) RECOMMENDED RATE APPLICATION FOR SOIL INJECT AT 2,000 \ POPULATION UNIT PER HECTARE. (30 DAYS AFTER PLANTING)

TYPE/FERTILIZER/ AMMENDMENTS	NO. SPLIT/ CYCLE /PERIOD/YEAR	RECOMMENDED RATE/ML LITER	NO. OFLITERS PERIOD/ YEAR/HAS	UNIT PRICE	DELIVERY SOLUTION ML/LITER/ HILL	TOTAL AMOUNT	COST PER HECTARE/ PERIOD/YEAR	REMARKS
SHUKAKU RIKI	3	20 ML	24 L	7,500.00	200 ML	18,000.00	1,384.61	100% SHUKAKU RIKI ORGANIC fertilizer. Application. 2 site/hill injection.
				TOTAL	AMOUNT -	18,800.00		

STAGES OF PANAMA DISEASE (*Fusarium oxysporum cubensi* sp.) SIGN AND SYMPTOMS BASE ON SEVERITY OF CAVENDISH BANANA :

CLEAN/HEALTHY CAVENDISH BANANA



**EARLY SYMPTOMS FOR PANAMA DISEASED
OF CAVENDISH BANANA**



EARLY TO MODERATE SYMPTOMS FOR PANAMA DISEASE OF CAVENDISH BANANA



MODERATE TO SEVERE SYMPTOMS FOR PANAMA DISEASED OF CAVENDISH BANANA



SEVERE SYMPTOMS FOR PANAMA DISEASED OF CAVENDISH BANANA



VERY SEVERE SYMPTOMS FOR PANAMA DISEASE SYMPTOMS OF CAVENDISH BANANA

