SM GROUP OF COMPANIES
EDAGUM SM RUS LLC

EDAGUM®SM
LIQUID HUMIC FERTILIZER

TEST RESULTS

TABLE OF CONTENTS

LIST OF RESEARCH INSTITUTES

- Don State Agrarian University (Russia)
- Moscow State University (Russia)
- State scientific establishment the All-Russia Research Institute of Rice
- All-Russia Research and Technology Institute of Rape
- Research Institute of Oil-Producting Crops n.a. V.S.Pustovoit (Russia, Krasnodar)
- All-Russia Research Institute Potatoes n.a. A.G.Lorkh
- Research Institute of Gardening n.a. I.V.Michurin (Russia)
- Stavropol Scientific Research Institute of Animal Industries and Fodder Production (Russia)
- North Caucasian Research Institute of Gardening and Viniculture (Russia)
- Russian Research Institute of Agricultural Microbiology of the Russian Agricultural Academy (Saint-Petersburg)
- Research Institute of Agriculture, Turkmen Agricultural University named after SA Niyazov
- Uzbek Cotton Research Institute (Surkhandarya Branch) in Surkhandarya region of Uzbekistan
- Uzbek Cotton Research Institute (Namangan branch)
- Institute of Genetics and Experimental Plant Biology
- Uzbek Institute of Plant Protection (Kokand branch)
- Uzbek Research Institute of Cotton Breeding & Seedage
- Kazakh Research Institute of Soil Science and Agricultural Chemistry named after U.U. Uspanov
- Niyazov Research Institute of Agriculture scientists (Turkmenistan)
- Uzbek Scientific Research Institute of Rice
- State Design and Technology Institute of soil fertility in Cherkassk (Ukraine)
- The Argentine National Institute of Agricultural Tehnology (INTA)
- Institute of Scientific & Industrial Research (India, Shriram)
- Research Institute of Agriculture of Abkhazia
- Uzbek Research Institute of Vegetable-cucurbits Crops and Potato
- Research Institute for Plant Protection (Mongolia)
- Kursk State Agricultural Academy named after Professor I. I. Ivanov

WHEAT

REPORT on a theme "Demonstration tests of EDAGUM®SM on winter wheat plants under conditions of Octyabrijskij district of Rostov area", Don State Agrarian University, 2007. The field experiment was carried out on winter wheat plants (cultivar Albatross Odesskij) on chernozem soil, with bare fallow as forecrop. The treatments were as follows: 1. Control; 2. Control + preplanting seeds treatment with EDAGUM®SM, 30 ml per ton (background); 3. Background + treatment of vegetating plants with EDAGUM®SM, 0.5 l/ha during tillering phase; 4. Background + 0.5 l/ha of EDAGUM®SM during tillering phase + 0.5 l/ha of EDAGUM®SM during earing phase.

Results:

1. Application of EDAGUM®SM promoted an increase of winter wheat yield.
2. Preplanting seeds treatment with EDAGUM®SM improved wheat overwintering, and increased its productive tilling capacity on 4-5%.
3. Under the action of early foliar fertilizing the yield of wheat increased on 26.8 %.
4. The greatest increase of wheat yield (on 29.1%) was at a combination of EDAGUM®SM applicationin all terms.
5. Treatment of wheat by fertilizer EDAGUM®SM promoted an improvement of grain quality: the fibrin content increased on 4.1%.
6. The application of EDAGUM®SM is economically reasonable. Relative net proceeds for all treatments achieved 6828 rub/ha (185.69 EUR/ha).

It is recommended to add application of EDAGUM®SM into the system of winter wheat fertilization under the conditions of Rostov area.

In 2008 Open Society "MAYAK" has tested fertilizer EDAGUM®SM in>on winter wheat (breed Concurent) with peas as forecrop. The square of field trial was 50 hectares, with 24 hectares as control. Sowing date was 28.09.07, the basic fertilizers were nitroammophos 16:16:16 (200 kg/hectare), and ammonium nitrate (150 kg/hectare).

Experimental design:

1. Control: NPK;
2. EDAGUM®SM 0.5 l/hectare + herbicides (Artstar, Dianal, Oxapal) at tillering phase;
3. EDAGUM®SM 0.5 l/hectare + fungicides at earing phase.

Results: Fertilizer EDAGUM®SM applied as foliar spray at tillering phase increased productive tillering capacity, and the grain yield per plant. Yield of winter wheat considerably increased under an influence of two feedings by EDAGUM®SM: an increase in yield was 5.23 centner/hectare (9.2% to the control).

Influence of late foliar feeding by EDAGUM®SM on yield quality demonstrated its advantage: content of gluten in grain increased on 3% to the control.

Significant influence of fertilizer EDAGUM®SM on winter wheat yield and its low application rates conditioned high economic efficiency of EDAGUM®SM

Influence of liquid humic fertilizer EDAGUM®SM on winter wheat yield, 2008

Treatment	Yield, centner/hectare	Additional yield	
		c/ha	%
Control	56,92	-	-
Experimental	62,15	5,23	9

Conclusions:

1. Application of fertilizer EDAGUM®SM promoted increase of winter wheat yield.
2. Foliar feedings at tillering and earing phases (0.5 l/hectare) increased yield and grain quality of winter wheat.
3. The combination of seeds treatment and foliar feedings gives opportunity to achieve the maximum effectivity from application of fertilizer EDAGUM®SM.

In 2007 farm «Chigarevo» (Kursk area) tested fertilizer EDAGUM®SM on winter wheat (breed Moscovskaya-39). Fertilizer EDAGUM®SM was applied for seeds treatment in a rate 0.2 l/ton of seeds; at herbicides treatment fertilizer (0.5 l/hectares) it was added together with herbicides and microfertilizers (Aquarin, 2 kg/hectare) in a mixture. At joint application no clogging of nozzles was observed, fertilizer was not preliminary filtered; no fungicide treatment was done.

As a result of fertilizer EDAGUM®SM application a negative influence of "chemical stress» on plants due to using of pesticides has decreased, seed ground germination capacity increased, plant growth and development enhanced, uptake of nutrients increased, level of plant diseases decreased on 25-30% in comparison to control. During spring frosts less leaf damage was observed, their faster growth, besides the yield increased on 4-5 ts/hectare, and gluten content raised on 2%.

In 2006-2007 farm «Malyshev» (Kursk area) tested fertilizer EDAGUM®SM on winter wheat (breed Moscovskaya-39). Fertilizer was applied in the farm during 2 years. Seeds were treated with fertilizer EDAGUM®SM before sowing(0.2 l/ton of seeds), at herbicides treatment EDAGUM®SM was added together with herbicides in a mixture. As a result of fertilizer EDAGUM®SM application seed ground germination capacity increased, plant growth and development enhanced. Wheat yield increased on 3-4 centner/hectares, gluten content increased on 3% which allowed to shift wheat from existing category to a higher one.

REPORT about field industrial tests of EDAGUM®SM product as a regulator of plants growth and development on wheat plants in Andizhan area of Republic of Uzbekistan, Institute of Genetics and Experimental Plant Biology, 2008, at Zangiatinsky area and at Kurgantepinsky area.

The results of field trials on studying the influence of double spraying of wheat plants by EDAGUM®SM, carried out in Andizhan area, testify its stimulating influence on further development of crops.

Double spraying of vegetating wheat plants (cultivar Moskvich) by EDAGUM®SM during tillering phase and repeatedly in booting phase (in a rate 450 ml/ha in each term of treatment) stimulates productive stalks formation, increases weight of 1000 grains and weight of grains in an ear, that promotes obtaining an additional grain yield at a rate of 3.5 centner/ha or 9.0% to the control. On the basis of the data obtained it is recommended to include EDAGUM®SM >into the "List of pesticides and agrochemicals, allowed for application in agriculture of Republic of Uzbekistan" as stimulator of plant growth and development promoting an increase of plant productivity.

Double spraying of vegetating wheat plants (cultivar Kroshka) by EDAGUM®SM (per 450 ml/ha in each term of treatment) gives a positive influence on the further development of plants. Application of EDAGUM®SM >during tillering phase and repeatedly in booting phase stimulates productive stalks formation (on 18.0 pieces/m^2), increases weight of 1000 grains and weight of grains in an ear, that promotes obtaining of an additional grain yield at a rate of 4.4 centners/ha or 10.8% to the control.

On the basis of the data obtained it is recommended to include a preparation EDAGUM®SM into

the "List of pesticides and agrochemicals, allowed for application in agriculture of Republic of Uzbekistan" as stimulator of plant growth and development

RESEARCH INSTITUTE OF AGRICULTURE, TURKMEN AGRICULTURAL UNIVERSITY named after SA Niyazov tested the effectiveness of fertilizer EDAGUM®SM on winter wheat in farms of different velayats of Turkmenistan: Akhal (southern Turkmenistan) Dashogus (north), Maryi (south-east) and Lebapski (east) in 2009. On each farm winter wheat was treated with fertilizer EDAGUM®SM on the area not less than 25 hectares.

As a result of a single spraying of winter wheat plants with EDAGUM®SM (0.4 l/ha) the yield increased by 3.5-4.2 t/ha (9-11%), gluten content in grain increased by 5%, the level of diseases decreased by 25-30%. The maximum effect was observed when using fertilizer EDAGUM®SM in a tank mix with insecticides: the yield gain was 4.9-5.8 kg / ha (13.5-15.8%).

It was found that EDAGUM®SM removed stress from plant protection products application, was technically easy to use, and allowed to avoid additional costs on application and to improve the economic efficiency of winter wheat protection system.

The effectiveness of liquid humic fertilizer EDAGUM®SM on winter wheat (variety Scythian), Seed Farm Bygdayly, Etrap Akbugday, Akhal velayat

Treatments	Biological yield, dt/ha	Additional yield	
		dt/ha	%
Control (no treatments)	38,1	-	-
Treatment with EDAGUM®SM at stem elongation stage, 400 ml + 300 l of water = 1 ha	**42,3**	**4,2**	**11,0**
Treatment with insecticide West Alpha 0.15 l/ha	41,2	3,1	8,1
Treatment at stem elongation stage with West Alpha 0.15 l/ha + EDAGUM®SM, 400 ml + 300 l of water = 1 ha	**43,4**	**5,3**	**13,9**

The effectiveness of liquid humic fertilizer EDAGUM®SM on winter wheat (variety Scythian), sh. Annau, Akhal Scientific and Experimental Centre

Treatments	Biological yield, dt/ha	Additional yield	
		dt/ha	%
Control (no treatments)	36,6	-	-
Treatment with EDAGUM®SM at stem elongation stage, 400 ml + 300 l of water = 1 ha	**40,3**	**3,7**	**10,1**
Treatment with insecticide Karate 0,2 l/ha	39,1	2,5	6,8
Treatment at stem elongation stage with West Alpha 0.15 l/ha + EDAGUM®SM, 400 ml + 300 l of water = 1 ha	**42,4**	**5,8**	**15,8**

The effectiveness of liquid humic fertilizer EDAGUM®SM on winter wheat (variety Yubileinaya), N. Andalip, Etrap Gurbansaltan, Dashoguz velayat

Treatments	Biological yield, dt/ha	Additional yield	
		dt/ha	%
Control (no treatments)	35,4	-	-
Treatment with EDAGUM®SM at tillering - stem elongation stage, 0,4 l/ha	**38,9**	**3,5**	**9,9**
Treatment at tillering - stem elongation stage with herbicide + EDAGUM®SM, 0,4 l/ha	**40,2**	**4,8**	**13,6**

The effectiveness of liquid humic fertilizer EDAGUM®SM on winter wheat (variety Scythian), Daikhan associations named after Dayhan, Etrap Oguzkhan, Maryi velayat

The effectiveness of liquid humic fertilizer EDAGUM®SM on winter wheat (variety Bytaran), Daikhan association named after Magtymguly, Etraphalachsky, Lebap velayat

Treatments	Biological yield, dt/ha	Additional yield	
		dt/ha	%

Treatments	Biological yield, dt/ha	Additional yield	
		dt/ha	%
Control (no treatments)	36,2	-	-
Treatment with EDAGUM®SM at stem elongation stage, 400 ml + 300 l of water = 1 ha	**40,1**	**3,9**	**10,8**
Treatment with insecticide West Alpha 0.15 l/ha	38,3	2,1	5,8
Treatment at stem elongation stage with West Alpha 0.15 l/ha + EDAGUM®SM, 400 ml + 300 l of water = 1 ha	**41,2**	**5,0**	**13,8**
Treatment with EDAGUM®SM at stem elongation stage, 400 ml + 300 l of water = 1 ha	36,4	-	-
Treatment with insecticide West Alpha 0.15 l/ha	**40,6**	**4,2**	**11,5**
Treatment at stem elongation stage with West Alpha 0.15 l/ha + EDAGUM®SM, 400 ml + 300 l of water = 1 ha	38,2	1,2	4,9
Treatment with EDAGUM®SM at stem elongation stage, 400 ml + 300 l of water = 1 ha	**41,3**	**4,9**	**13,5**

In 2010 Ltd. "AGROSOYUZ - Kuban" conducted field tests of humic fertilizer EDAGUM®SM on winter wheat on the farms of Krasnodar region (farm "Zhuchenko", farm "Ivan Panin", farm "Kolos", Rice-breeding factory "Krasnoarmeisky"). It is established that the application of humic fertilizer promoted additional grain yield from 6.8 to 10.3 dt/ha (16.3 - 17.9%).

In 2008 Open Company «Finansagro» tested fertilizer EDAGUM®SM on spring wheat (breed Duet) in Chelyabinsk area.

Experimental design:

1. Control (background): seed protectant Tebu-60 (0.4 l/ton) + Fenisan (0.2 l/hectare) + $N_{50}P_{50}K_{50}$;
2. Background + EDAGUM®SM 0.22 l/hectare before sowing;
3. Background + EDAGUM®SM 0.22 l/hectare before sowing + EDAGUM®SM 0.45 l/hectare in tillering – leaf-tube formation phase.

Influence of fertilizer EDAGUM®SM on yield (breed Duet), yield structure and production quality of spring wheat in 2008

Treatment	Amount of plants, mln ps/ha	Productive tillering capacity	Weight of 1000 grains, g	Grain weight per plant, g	Yield, centner /ha	Additional yield		Gluten content
						c/ha	%	
Control	3,83	1,41	34,0	0,51	19,0	-	-	24,3
Treatment #1	4,03	1,50	35,1	0,53	20,0	1,0	5,3	25,1
Treatment#2	4,14	1,61	36,5	0,55	22,5	3,5	18,4	27,0

Economic efficiency of fertilizer EDAGUM®SM application on spring wheat (breed Duet) in 2008

Treatment	Yelt centner/ hectare	Additional yield, centner/hectare	Cost of additional yield, Rub/ha	Expenses for EDAGUM®SM , Rub/ha	Net profit, Rub/ha
Control	19,0	-	-	-	-
Treatment #1	20,0	1,0	550	6,6	543,4
Treatment #2	22,5	3,5	1925	65,1	1859,9

The application of **EDAGUM®SM** (450 ml/ha in the leaf-tube formation + 450 ml/ha in the earing phase) on the **black earth in the Tambov region** (farms of the public limited companies **"Zolotaya Niva" and "Stepnoye Gnezdo"**) resulted in spring wheat yield increase of **12.9 to 15.5%**, winter wheat yield increase ranged from **20.1 to 26.4%** compared with the control.

In 2011 experts from the Don State Agrarian University tested EDAGUM®SM on the spring wheat on the common black earth in the Rostov region according to the following schedule: 500 ml/t - seed treatment + 400 ml/ha during the tillering stage + 400 ml/ha during the earing phase. The yield increase was 5.2 ql/ha, or 24.1%. While applying the schedule 1000 ml/t - seed treatment + 1000 ml/ha during the tillering stage + 1000 ml/ha during the earing stage, the yield increased by 6.3 ql/ha or 29.2%.
The quantity of crude gluten in seeds increased by 2.0 to 3.0 %.

"LOGOS GRAIN", LLP (KAZAKHSTAN, THE AKMOLA REGION) - In 2015 it carried out production experiments to study the effect of the EDAGUM®SM fertilizer on crop yields of spring wheat. The experimental design: seed treatment with EDAGUM®SM (500 ml/t of seed) + treatment with EDAGUM®SM (500 ml/ha) with herbicides. Preceding crop: linseed flax. As a result of the application of EDAGUM®, the field germination increased, as well as the plant growth and development. Spring wheat yield was 20.6 ql/ha (control - 18.5 ql/ha), or increased by 11.4%.

In **2015** scientists at the **Don State Agrarian University** modified the zonal cultivation technology of winter wheat on the common black earth in the Rostov region: reduced the main amount of mineral fertilizers **by 30%**, norms of pesticides introduction **by 10%** and apllied the **EDAGUM®SM** solution to the crops as follows - secondary tillage - **2.0 l/ha** + presowing seed treatment - **0.4 l/t** + double foliar application with a dose of **0.4 l/ha** during the tillering and booting stages. The complex of these methods **increases the yield by 39.4%**, reduces the cost for mineral fertilizers and pesticides, increases the environmental safety of the products.

RESEARCH INSTITUTE FOR PLANT PROTECTION OF THE MINISTRY OF AGRICULTURE OF THE REPUBLIC OF MONGOLIA in 2019 conducted field trials of EDAGUM®SM in wheat cultivation. The use of EDAGUM®SM fertilizer according to the following scheme: pre-sowing treatment of seeds - 0.4 l/t + double treatment foliar treatment at a dose of 0.8 l/ha, increased wheat yield by 9.2 c/ha or by 33.6% compared with control.

COTTON

RESEARCH INSTITUTE OF AGRICULTURE, TURKMEN AGRICULTURAL UNIVERSITY named after SA Niyazov tested the influence of fertilizer EDAGUM®SM on growth, development and yield of cotton plants in farms of Maryi, Akhal, Lebap and Dashoguz velayats of Turkmenistan.

EDAGUM®SM was used for pre-planting seed treatment and single foliar application during growing season. Pre-sowing treatment enhanced the seeds germination by 9%, reduced root rot disease by 17.8%, increased the height of the main stem, promoted more bolls formation. As a result the additional cotton yield achieved 2.9-4.7 dt/ha (8,8-14,5%). The highest additional yield from 4.0 up to 6.6 dt/ha (12,2-20,3%) was obtained in combined treatment: cotton seeds treatment and spraying plants during the growing season.

Influence of EDAGUM®SM on the growth and development of cotton
(variety “Yoloten-7”, Daikhan association named after Daghan, Etrap Oguzkhan, Maryi velayat)

Treatments	Main stem height	Amount, pc/plant					
		Sympodial branches	Monopodial branches	Buds	Flowers	Buttons	Bolls
Control (notreatment)	71,5	13,9	0,6	2,8	1	2	11,5
EDAGUM®SM seeds treatment (200 ml/t)	**80,2**	**14,3**	**0,7**	**1,5**	**2**	**1**	**12,6**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**85,5**	**14,5**	**0,7**	**1,0**	**1**	**2**	**14,5**

Influence of EDAGUM®SM on cotton yield
(variety “Yoloten-7”, Daikhan association named after Daghan, Etrap Oguzkhan, Maryi velayat)

Treatments	Average amount of bolls per plant, pc.	Weight of raw cotton in one boll, g	Weight of raw cotton in average from one plant, g	Plant density, pc/ha	Yield, dt/ha	Deviance from control, dt/ha	Deviance from control, %
Control (notreatment)	13,5	3,2	43,2	75,8	32,8	-	-
EDAGUM®SM seeds treatment (200 ml/t)	**14,0**	**3,3**	**46,2**	**77,2**	**35,7**	**+2,9**	**8,8**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**14,3**	**3,32**	**47,5**	**77,5**	**36,8**	**+4,0**	**12,2**

Influence of EDAGUM®SM on the growth, bolls formation and density of cotton plants
(variety “Yoloten-7”, Vatan, etrap Akbugday of Akhal velayat)

Treatments	Main stem height, cm	Amount of bolls, pc/plant		Plant density, pc/ha
		Total	Opened	
Control (notreatment)	79,0	10,0	6,0	86,2
EDAGUM®SM seeds treatment (200 ml/t)	**92,0**	**12,2**	**11,0**	**92,0**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**98,0**	**15,0**	**12,5**	**92,6**

Influence of EDAGUM®SM cotton yield
(variety “Yoloten-7”, Vatan, etrap Akbugday of Akhal velayat)

Treatments	Yield, dt/ha				Additio
	1 harvest	2 harvest	3 harvest	Total	nal yield, dt/ha
Control (notreatment)	27,0	3,0	2,5	32,5	-
EDAGUM®SM seeds treatment (200 ml/t)	**31,0**	**3,2**	**3,0**	**37,2**	**4,7**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**32,5**	**3,5**	**3,1**	**39,1**	**6,6**

Influence of EDAGUM®SM on the growth, bolls formation and density of cotton plants
(variety “Yoloten-7”, Magtymguly, etrap Halach of Lebap valayat)

Treatments	Main stem height, cm	Amount of bolls, pc/plant		Plant density, pc/ha
		Total	Opened	
Control (notreatment)	68,0	11,0	8,0	70,6
EDAGUM®SM seeds treatment (200 ml/t)	**72,0**	**11,2**	**10,0**	**75,5**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**73,2**	**14,8**	**11,5**	**76,9**

Influence of EDAGUM®SM on cotton yield
(variety “Yoloten-7”, Magtymguly, etrap Halach of Lebap valayat)

Treatments	Yield, dt/ha				Additio
	1 harvest	2 harvest	3 harvest	Total	nal yield, dt/ha
Control (notreatment)	28,5	3,2	2,8	34,5	-
EDAGUM®SM seeds treatment (200 ml/t)	**31,2**	**3,5**	**3,3**	**38,0**	**+3,5**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**32,9**	**3,9**	**3,0**	**39,8**	**+5,3**

Influence of EDAGUM®SM on growth and development of cotton plants
(variety “Yoloten-7”, N. Andalip, Etrap Gurbansaltan of Dashoguz valayat)

Treatments	Main stem height	Amount, pc/plant					
		Sympodial branches	Monopodil branches	Buds	Flowers	Buttons	Bolls
Control (notreatment)	63,8	11,0	0,5	1,9	2	3	10,5
EDAGUM®SM seeds treatment (200 ml/t)	**69,5**	**12,3**	**0,5**	**1,0**	**2**	**2**	**11,3**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**71,4**	**13,4**	**0,6**	**0,8**	**1**	**2**	**12,4**

Influence of EDAGUM®SM on cotton yield
(variety “Yoloten-7”, N. Andalip, Etrap Gurbansaltan Dashoguz of Dashoguz valayat)

Treatments	Average amount of bolls per plant, pc.	Weight of raw cotton in one boll, g	Weight of raw cotton in average from one plant, g	Plant density, pc/ha	Yield, dt/ha	Deviance from control, dt/ha	Deviance from control, %
Control (notreatment)	14,0	3,3	46,2	70,8	32,7	-	-
EDAGUM®SM seeds treatment (200 ml/t)	**14,5**	**3,32**	**48,1**	**73,2**	**35,2**	**+2,5**	**7,6**
EDAGUM®SM seeds treatment (200 ml/t) + spraying (400 ml/ha)	**15,2**	**3,33**	**50,6**	**74,0**	**37,5**	**+4,8**	**14,7**

In 2010 UZBEK COTTON Research Institute (Surkhandarya Branch) in Surkhandarya region of Uzbekistan investigated the efficacy of the fertilizer EDAGUM®SM on cotton (variety Bukhara-102).

Cotton plants were sprayed twice during vegetation: in stages of budding and beginning of flowering at rates 200, 300 and 400 ml/ha. It was established that the fertilizer accelerated the bolls opening on 9,6-12,9%, increased the weight of one boll by an average of 0.1 g. As a result additional yield of cotton in 3.2-3.6 dt/ha, or 11.1 - 12.8% to control was obtained.

UZBEK COTTON Research Institute (Namangan branch) examined the effect EDAGUM®SM on cotton yield in 2010. Cotton plants which have been treated with humic fertilizer in doses of 200-400 ml/ha were 5.8-6.0 cm higher than the control ones, increase the number of disclosed cotton bolls (at 7.7-8.0%), and acceleration of flowering and reduction in lesion wilt (at 1.3-1.5%) were observed. As a result, the cotton yield increased by 3.9 dt/ha, or 12.5% to control.

UZBEK Institute of Plant Protection (Kokand branch) in the Fergana area of Uzbekistan, conducted the field trials of the fertilizer EDAGUM®SM on cotton variety "S-6524" in 2010. Cotton plants were sprayed with fertilizer twice in budding (400 ml/ha) and flowering stages (400 ml/ha). EDAGUM®SM had a significant impact on plant growth and development: an increase in plant height at flowering stage by 5 cm; increase in the total number of bolls by 11 pieces, and increase the number of disclosed cotton bolls in average by 1.2 pc. as compared with the control. Application of EDAGUM®SM helped to accelerate boll opening by 5.5%, increase in weight of one boll in average by 0.6 g. As a result, additional raw cotton yield in 4.0 dt/ha, (13.3%) was obtained.

UZBEK Research Institute of COTTON BREEDING AND SEEDAGE tested humic fertilizer EDAGUM®SM on cotton (variety C-6524) in Akkurgan district of Tashkent area of Uzbekistan in the fields of Experimental farm of the Institute in 2010. EDAGUM®SM was used for pre-treatment of seeds (200 ml/t) and two-time plants spraying during budding and flowering (400 ml/ha).
EDAGUM®SM accelerated the emergence of cotton seedlings on 2-3 days, stimulated flowering and ripening, increased the number of bolls per plant in average by 5.6 pc., increased the weight of each boll by 1.5 g, opening bolls by 14.7 %, which contributed to the production of additional cotton yield in 4.7 dt/ha (8%) compared to control.

In the farm "MUNIS MUKARRAM" (Kuva district, Fergana area, Uzbekistan) due to foliar spray of cotton plants by fertilizer EDAGUM®SM during budding and early flowering at doses of 200-400 ml/ha was an increase in size of bolls, fiber length were obtained, which provided additional yield of raw cotton in 6-8 dt/ha, which was 25-30% to control.

Kazakh Research Institute of Soil Science and Agricultural Chemistry named after U.U. Uspanov in 2012 conducted tests on the use of fertilizer EDAGUM®SM on cotton in the south and south-east of Kazakhstan. Field and industrial experiments were conducted in Maktaralskiy district on light- gray soils. Schemes of the experiments are as follows:
Field experiment was held on experimental fields of the Kazakh Research Institute of Cotton.

1. Control
2. $N_{150}P_{80}K_{60}$
3. $P_{80}K_{60} + N_{KC}$
4. $P_{80}K_{60} + N_{KAC}$
5. Two-times spraying of cotton plants in stages of germination and early flowering by water solution of EDAGUM®SM in rate of 400 ml per 300 liters of water (consumption rate is 300 liters per 1 ha).Plot area is 50 m^2 in 3 replicates. Total area of experiment was 750 m^2.

Industrial experiment was held in the fields of LLP "Ketebay" as follows:

1. Control
2. Two-times spraying of cotton plants in stages of germination and early flowering by water solution of EDAGUM®SM the rate of 400 ml per 300 liters of water (consumption rate is 300 liters per 1 ha).

Areas of both treatments were 1 hectare.
Two-times spraying of cotton plants with water solution of EDAGUM®SM showed to be an effective

agronomic technique. On treatments with 2-fold spraying by water solution of EDAGUM®SM additional yield of raw cotton in field experiment on irrigated light gray soils was 7.8 dt/ha or 46% to control. This effect was also confirmed by the yield data of industrial experiment, where additional yield

was 8.1 dt/ha or 43%.to control.

In 2014 while conducting research on the fertilizer`s application to the Iolotan-7 cotton variety, the Niyazov Research Institute of Agriculture scientists used the following technology of the EDAGUM®SM application to soil: pre-sowing soil spraying with EDAGUM®SM (2.0 l/ha) + seed treated with the P-4 65% preparation (4.0 l/t) and EDAGUM®SM (0.4 l/t) + spraying after the vegetation during the growing season of 2 to 3 real leaves with EDAGUM®SM (0.4 l/ha) + baiting with 2 vegetation irrigation with EDAGUM®SM (1.0 l/ha) + fertilizer application at a rate of P_{200} + $N_{335+165}$ + K_{30}. The yield increase was 19.6%.

Variants	Number of plants per 1 ha, in thousands	Number of bolls in 1 bush	Weight of raw cotton in 1 open boll, g	Weight of raw cotton in 1 bush, g	Biological yield, s/ga	Departure from the control, s/ga (%)
1. Control	73.9	11.0	3.2	35.2	26.0	±0
EDAGUM®SM	80.1	12.0	3.35	40.2	31.1	+5.1 (19.6%)

By applying the same technology, but with reduction of norms of mineral fertilizers - phosphorous and nitrogen fertilizers by 20%, potash ones by 15% (P_{160} + $N_{268+132}$ + K_{25}), yield increase is up to 12% (3.2 ql/ha). In this case due to the yield increase and mineral fertilizer saving, the profit is $ 40.7 per 1 hectare.

BARLEY

In 2007 farm "Chigarevo" (Kursk area) - tested fertilizer EDAGUM®SM on brewing barley (breed Passadena) Fertilizer EDAGUM®SM was applied as a single foliar treatment of barley in tillering phase (0.2 l/hectare) in a mixture with herbicides and microfertilizer (Aquarin, 2 kg/hectare). As a result barley yield increased on 3 centner/hectare. No excess of protein content was observed.

Double treatment of barley by herbicide+ EDAGUM®SM (0.5 l/hectare) in tillering phase and fungicide+ EDAGUM®SM (0.5 l/hectare) in earing phase resulted in increase of yield on 5 centner/hectare. An increase of protein content in grain up to 15% was observed, whereas regular rate is 11.5%.

Conclusion: At barley cultivation for brewing purposes a single application of EDAGUM®SM is reasonable at in a rate not higher then 0.3 l/hectare together with joint application of microfertilizers.

In 2006-2007 farm «Malyshev» (Kursk area) tested fertilizer EDAGUM®SM on spring brewing barley (breed Passadena).

Fertilizer EDAGUM®SM was applied as a single foliar treatment of barley (0.2 l/hectare) in a mixture with herbicide and microfertilizer (Aquarin, 2 kg/hectare).

As a result barley yield increased on 4 centner/hectare. No excess of protein content was observed (protein did not exceed regular rate 11.5%)

Ltd. "AGROSOYUZ-Kuban" (Krasnodar Region) in 2010 applied humic fertilizer EDAGUM®CM on winter barley crops (variety "Dobrynia-3") in the farm "Ivan Panin" (Novopokrovsky district, 100 ha) and farm “Kolos” (Timashevsky district, 200 ha). Two-time foliar application provided an increase of winter barley grain yield by 7.2 -10.3 kg/ha (17.3 - 17.9%).

In the **Tambov region (farms of the public limited companies "Zolotaya Niva" and “Stepnoye**

Gnezdo") crops of barley was treated with **EDAGUM®SM** (450 ml/ha in the tillering stage +450 ml/ha**)**, and the yield increased by **25.3 to 30.2 %**.

RICE

REPORT on research work "Study of efficiency of liquid humic fertilizer EDAGUM®SM on rice plants", State scientific establishment the All-Russia Research Institute of Rice, 2007

The field experiment was carried out on rice crops (cultivar Rapan) on chernozem-like meadow weakly solonized clay loam soil of Krasnodar Territory, with bare fallow as forecrop. The treatments were as follows:

1. Background fertilization $N_{100}P_{50}K_{40}$;
2. Background + seeds treatment with EDAGUM®SM, 30 ml per ton;
3. Background + treatment of vegetating plants with EDAGUM®SM, 450 ml/ha during tillering (5-6 leaf);
4. Background + treatment of vegetating plants with EDAGUM®SM, 450 ml/ha during tillering and booting (8-9 leaf), 450 ml/ha.

Results:

1. Application of EDAGUM®SM promoted an increase of rice yield.
2. Treatment of rice seeds with EDAGUM®SM by a half-dry method (10 liters per ton) in a rate 30 ml/ton provided an increase of seedlings density on 4% and yield on 0.37 tons per hectare.
3. Foliar fertilizing of rice plants during a tillering phase in a rate 450 ml/ha resulted in an increase of yield on 0.51 t/ha.
4. The most significant increase of yield was obtained with plants treatment during tillering and booting phases in rates 450 ml/ha: 0.62 ton/ha.
5. The combination of seeds treatment and foliar fertilizing of rice plants with EDAGUM®CM in phases of tillering and booting enables to achieve the maximal effect from the application of this fertilizer.
6. The application of EDAGUM®SM is economically reasonable. Relative net proceeds for double treatment in rates 450 ml/ha in phases of tillering and booting achieved 3095 rub/ha (84.17 EUR/ha).

In 2008 EDAGUM®SM was tested on rice (breed Khazar).

Experimental:

1. Control: $N_{120}P_{30}K_{20}$ (without treatment of seeds and plants);
2. $N_{120}P_{30}K_{20}$ + preplant seed treatment (220 ml of EDAGUM®SM + 10 l of water = 1 ton of seeds);
3. $N_{120}P_{30}K_{20}$ + foliar spray on rice plants in tillering phase (450 ml of EDAGUM®SM + 300 l of water = 1 hectares) + foliar spray on rice plants in shoot phase (450 ml EDAGUM®SM + 300 l of water = 1 hectares);
4. $N_{120}P_{30}K_{20}$ + preplant seed treatment (220 ml of EDAGUM®SM + 10 l of water = 1 ton of seeds)+ foliar spray on rice plants in tillering phase (450 ml of EDAGUM®SM + 300 l of water = 1 hectares) + foliar spray on rice plants in shoot phase (450 ml EDAGUM®SM + 300 l of water = 1 hectares);
5. $N_{120}P_0K_0$ + preplant seed treatment (220 ml of EDAGUM®SM + 10 l of water = 1 ton of seeds)+ foliar spray on rice plants in tillering phase (450 ml of EDAGU$^{M®}$SM + 300 l of water = 1 hectares) + foliar spray on rice plants in shoot phase (450 ml EDAGUM®SM + 300 l of water = 1 hectares).

Results:

1. Application of EDAGUM®SM promoted increase rice yield.
2. Treatment of rice seeds by EDAGUM®SM provided increase of yield on 0.35 t/hectares.
3. Foliar feedings of rice plants by EDAGUM®SM at rates 450 ml/hectare in tillering and shooting phases provided increase of yield on 0.53 t/hectares.
4. The most considerable additional yield – 0.67 t/hectares – was obtained at seed treatment (EDAGUM®SM, 220 ml/t) with following foliar feedings per 450 ml/hectares in tillering and shooting phases.
5. Application of EDAGUM®SM on trials where no phosphoric and potassium fertilizers were used resulted in no decrease in rice yield in comparison with trials where these fertilizers were applied.
6. Increase of yield on treatments with EDAGUM®SM application occurred due to increase of rice plants quantity, grain weight per plant, weight of 1000 grains, and also owing to decrease of blind-seeds.
7. Processing of rice seeds by EDAGUM®SM (220 ml/t) provided faster formation of shoots (2-3 days earlier), increase of shoots quantity on 3-5%, increase of their survival rate on 6-8%, and also faster coming of flowering and ripening phases (3-4 days earlier).
8. Use of EDAGUM®SM promoted increase of rice plants provision by nitrogen on 2.5-6.2%, at seeds treatment combined with foliar feeding in tillering phase on 2,3-10,0 %.
9. No significant changes in grain quality parameters typical for rice breed Khazar was revealed due to application of EDAGUM®SM.

In 2007 Open Companies AF "Slavyanskaya" (Krasnodar territory) tested fertilizer EDAGUM®SM on rice crops (breed Rapan) on 2100 hectares.

EDAGUM®SM was applied as single treatment in a mixture with herbicides in a rate 1 l/hectare. This reduced plant stress from influence of agrochemicals and did not require any additional expenses for its application.

As a result of using of EDAGUM®SM rice ripened earlier, which allowed to start harvesting 5-6 days earlier. The better plants resistances to drowning, low level of blind-seed disease, even maturing of lateral sprouts, larger and smoother grain were observed. Treated crops were not damaged by blast disease of rice. In comparison with untreated trials the yield of increased on 5-7 centner/hectare

In 2010 Uzbek Scientific Research Institute of Rice conducted the field trials of fertilizer EDAGUM®SM on rice (variety "Iskander") in Tashkent and Khorezm areas of Uzbekistan and in laboratory experiments. Fertilizer was used for pre-sowing seeds treatment (200 ml/t) and during the vegetation plants were sprayed at tillering stage (400 ml/ha).
EDAGUM®SM stimulated germination energy, germination, increased the length of the stems, roots and seedlings biomass.
As a result of EDAGUM®SM application panicle length and 1000-grain weight increased, blind- seed disease decreased, and the yield increase achieved 6.8 dt/ha (11.6%) compared to control.

In 2012 the **Uspanov Kazakh Soil Science and Agrochemistry research institute, LLP** conducted field and production tests on efficiency of the EDAGUM®SM application to rice in southern and south-eastern Kazakhstan. In the Balkhashsky district the tests on the EDAGUM®SM application to rice yields were carried out at the soil reaction tester of the Ilisky expedition of the Uspanov Kazakh Soil Science and Agrochemistry research institute on soil in the Bakbaktinsky rural district. Soil: rice and bog soils
The test was carried out according to the following scheme:

1. Control: untreated seeds
2. The seeds were treated with EDAGUM®SM water solution in the dose - 400 ml of EDAGUM®SM + 10 l of water per 1 ton of rice seeds.
3. The test was repeated three times, the area of test strips is 100 sq.m. The total testing area: 600 sq.m.

The biological rice yields show that the recommended concentration of the EDAGUM®SM application in field experiments has a positive effect.
Influence of the pre-sowing seed treatment with the EDAGUM®SM water solution on the productivity

of rice variety "Bakanassky" on the rice-bog soils.

Variants	Repeated yields, ql/ha			Average crop yield, ql/ha	Increase	
	1	2	3		ql/ha	%
Control - untreated	29.5	28.6	30.1	29.4	-	-
EDAGUM®SM	**34.5**	**33.5**	**33.9**	**34.0**	**4.5**	**15.5**

The yield increase after the pre-sowing seed treatment of the "Bakanassky" rice variety with the EDAGUM®SM water solution on the rice-bog soils compared to the control is **4.5 ql/ha** or **15.5%.**

RAPE

In 2007-2008 All-Russia Research and Technology Institute of Rape studied possibilities of using EDAGUM®SM at cultivation of summer rape (breed Ratnik) for oilseeds in Central Chernozem region.

Experiment included treatments with preplant seeds processing and foliar feeding in phases of leaf rosette and budding- early flowering.

The biggest increase of yield from using fertilizer EDAGUM®SM (9-12% to control) was obtained at its triple application. Scientists established that yield increase was caused by a positive action of humic fertilizer on development of reproductive rape parts (pods and seeds): 2-3 additional pods per plant were formed; the weight of 1000 grains was 0.05 – 0.08 g higher then on control. At use of fertilizer EDAGUM®SM oil yield increased on 83-108 kg/hectares in comparison with cultivation without fertilizer

RESEARCH INSTITUTE FOR PLANT PROTECTION OF THE MINISTRY OF AGRICULTURE OF THE REPUBLIC OF MONGOLIA in 2019 conducted field trials of EDAGUM®SM in the cultivation of rapeseed. The introduction of the drug according to the scheme: pre-sowing treatment of seeds 0.4 l/t + double treatment of vegetative plants at a dose of 0.8 l/ha made it possible to obtain an increase in yield of 5.2 c/ha or 80% in relation to the control.

SUNFLOWER

In 2007 Open Societies **"Druzba"** (Rostov area) tested fertilizer EDAGUM®SM on sunflower (breed PR 63 A 90).

Despite unfavorable weather conditions, single foliat treatment of sunflower by fertilizer EDAGUM®SM in a rate 0.450 l/hectare promoted obtaining of additional yield of 3.3 centner/hecta

Treatment	Yield, c/ha	Additional yield	
		c/ha	%
Control	15,3	-	-
EDAGUM®SM	18,6	3,3	21,5

Joint-Stock Company **"Agriko AM"** conducted testing of liquid humic fertilizer EDAGUM®SM on sunflower (crossbreed Victoria) on a base of a farm Open Company «Solnechnaya Strana» in Volgograd area. Agricultural technique of sunflower cultivation was following: surface harrowing, cultivation, application of herbicide RAP, manual weed eradication against couch grass and dindle.

Sunflower seeds treated with fertilizer EDAGUM®SM (220 ml/ton of seeds), vegetating plants treated in a phase of 7-8 real leaves (rate of fertilizer is 0.450 l/hectares).

As a result of application of fertilizer EDAGUM®SM a significant additional sunflower yield was obtained: 2.8 centner/hectare which is 18.1% to control.

Influence of application fertilizer EDAGUM®SM on sunflower (crossbreed Victoria), 2007:

Treatment	Yield, c/ha	Additional yield	
		c/ha	%
Contriol	15,5	-	-
EDAGUM®SM	18,3	2,8	18,1

In 2008 Research Institute of Oil-Producting Crops n.a. V.S.Pustovoit tested the efficiency of use of fertilizer EDAGUM®SM on Krasnodar on early sunflower (crossbreed Jupiter).

Experimental:

1. Control (without fertilizers);
2. Seeds treatment: 220 ml EDAGUM®SM + 15 l of water per 1 ton of seeds;
3. Spraying of plants in a phase of 3 pairs of real leaves (450 ml EDAGUM®SM + 300 l of water per hectare) + spraying of plants 14 days after the previous spraying (450 ml EDAGUM®SM + 300 l of water per hectare);
4. Seeds treatment (220 ml EDAGUM®SM) + spraying of plants in a phase of 3 pairs of real leaves (450 ml EDAGUM®SM + 300 l of water per hectare) + spraying of plants 14 days after the previous spraying (450 ml EDAGUM®SM + 300 l of water per hectares).

Results:

1. Under unfavorable weather conditions during periods of flowering and seed plumpness of sunflower (air temperature was 29.5-37.5°C) EDAGUM®SM promoted increase of amount of achenes in anthodia on 32-45 pieces, increase of weight of 1000 seeds on 1.1-1.6 t/hectares; maintained yield of seeds on 0.14-0.20 t/hectares (4,7-6,7 %), and yield of oil on 0.08-0.09 t/hectares or 6.0-6.7%.
2. The highest yield (3.17 t/hectares) was obtained on treatment of sunflower seeds with EDAGUM®SM (220 ml EDAGUM®SM + 15 l of water per1 ton of seeds) + spraying of plants in a phase of 3 real leaves (450 ml EDAGUM®SM + 300 l of water per hectare) + spraying 14 days after (450 ml EDAGUM®SM + 300 l of water per hectare)

Treatment	Amount of achenes in anthodia		Weight of 1000 seeds		Yield of seeds		Oil content		Yield of oil	
	ps.	to control + ps.	g	to control + g	t/ha	to control + t/ha	%	to control + %	t/ha	to control + t/ha
1	1202	-	59,0	-	2,97	-	50,3	-	1,34	-
2	1234	32	60,1	1,1	3,11	0,14	50,6	+0,3	1,42	0,08
3	1238	36	60,2	1,2	3,13	0,16	50,9	+0,6	1,43	0,09
4	1247	45	60,6	1,6	3,17	0,20	50,0	-0,3	1,43	0,09
HCP_{05}		29		1,41		0,13		1,01		0,06

In 2010 Ltd. "AGROSOYUZ - Kuban" tested fertilizer EDAGUM®SM in Krasnodar area on sunflower crops on lands of farms: farm “Kolos” (sunflower variety "Jupiter", Timashevsky District), Rice-breeding factory "Krasnoarmeiskiy" (variety "Rodnik-453", Krasnoarmeiskiy District), farm "Ivan Panin "(variety "Kubansky 247 MV", Novopokrovsky district) and farm "Zhuchenko LL" (variety "Brion", Novopokrovsky district). As a result of EDAGUM®SM application a significant increase in sunflower seeds yield was obtained: from 3.0 to 4.8 dt/ha, or 16.1 -17.2%.

GRAIN MAIZE

In 2010 Ltd. "AGROSOYUZ - Kuban" tested the effect of fertilizer EDAGUM®SM in Krasnodar area in farm "Zhuchenko", farm "Panin IA", farm "Kolos", Rice-breeding factory "Krasnoarmeyskiy" in field trials with grain maize. Different maize varieties ("Kuban 320 SV", "Soyuz 400 MV", and "Furio") in area of more than 500 hectares were tested.

It was found that two-time foliar treatment with EDAGUM®SM enhanced the grain yield of maize by 4.2 - 5.9 dt/ha, or 12.4 - 13.6%.

JSC "KazAgroInnovation" and "Kazakh Research Institute of Soil Science and Agricultural Chemistry named after U.U. Uspanov" in 2012 conducted tests on the application of liquid humic fertilizer EDAGUM®SM on maize crops in the south and south-east of Kazakhstan.

In Enbekshi-Kazakh area in the farm "Oksana" field experiment was held to determine the effectiveness of EDAGUM®SM application on maize variety "ZPSK 539" on meadow-gray soils. The area under the experiment was 6 hectares. Experimental design:

1. Control - no spraying.
2. Treatment of vegetating maize plants with water solution of EDAGUM®SM at rate 400 ml per 300 liters of water (consumption rate of working solution is 300 liters per hectare) at 3-4-leaf growing stage.

The area of control treatment is 5 hectares, and 1 ha for the experimental treatments.

Results:

1. Yield on control treatment ($N_{92}P_{92}$ – no spraying) was 51.6 dt/ha.
2. Yield on control treatment + foliar spray on vegetating plants (400 ml EDAGUM®SM to 300 liters of water per 1 ha) was 57.2 dt/ha.

Thus, the results of field experiment on meadow-gray soils of Enbekshi-Kazakh area showed that the grain yield of maize (variety "ZPSK 539") increased by 10.8%, with the average yield of the background $N_{92}P_{92}$ being 51.6 due to a single foliar treatment with EDAGUM®SM.

SOYBEAN

Ltd. "AGROSOYUZ - Kuban" tested the effectiveness of humic fertilizer EDAGUM®SM on soya in Krasnodar area. Field trials (200 ha) were carried out on the basis of Federal State Unitary Enterprise Rice-breeding factory "Krasnoarmeisky" (Krasnoarmeisky district), with soybean variety "Lira". Plants were sprayed twice during the growing season with the fertilizer EDAGUM®CM, and a significant increase in grain yield in 6.3 dt/ha was obtained, which accounted 39.2% to control.

Influence of fertilizer EDAGUM®SM on soybean yield
(variety "Lira", Federal State Unitary Enterprise Rice-breeding factory "Krasnoarmeisky")

Treatments	Yield, dt/ha	Additional yield	
		dt/ha	%
Control	16	-	-
EDAGUM®SM	**22,3**	**6,3**	**39,2**

In 2010 the **State Design and Technology Institute of soil fertility in Cherkassk (Ukraine)** carried out production tests of EDAGUM®SM on soybeans (the Verskla variety) according to the schedule: seed treatment (200 ml/1 t of seed) + Rizofobit (200 ml/t) + EDAGUM®SM application during the stage of 5 leaves (400 ml/ha). The yield increase was 7.0 ql/ha, or 36.5% in comparison with the control.

During the production tests on the application of EDAGUM®SM in 2014-2015, **THE ARGENTINE NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGY (INTA)** revealed high efficacy of the product on soya crops - soybeans obtained yield increase of up to 1281 kg/ha, or 33.7%. (according to the schedule: 1000 ml/ha - secondary tillage + 800 ml/t of seed + 400 ml/ha during the vegetation stage + 800 ml/ha during the reproductive phase). One experiment resulted in the yield increase of 815 kg/ha or 21.5% with the reduction of mineral fertilizers of 20%.

POTATOES

In 2008 of All-Russia Research Institute Potatoes n.a. A.G.Lorkh investigated efficiency of application of EDAGUM®SM in Ljuberetsky district of Moscow area on two early-maturing potato breeds (Zhukovsky early and Udacha).

Experimental:

1. Background: $N_{120}P_{120}K_{150}$ (soil application of fertilizers) + planting untreated potato;
2. Background: $N_{120}P_{120}K_{150}$ (soil application of fertilizers) + planting potato treated with EDAGUM®SM before planting + 2 treatments of vegetating plants with EDAGUM®SM in phases of early flowering and full flowering.

Results:

1. Treatment of potato seeds before planting combined with two treatments of vegetating plants with EDAGUM®SM in promoted increase of potato- yield on 9-24%, for breeds Zhukovsky early and Udacha accordingly.
2. EDAGUM®SM demonstrated positive influence on yield formula (increase in marketable potato fraction) and improved production quality parameters.
3. In a treatment with processing of potato breed Udacha with EDAGUM®SM an increase of dry matter on 1.6% comparably to control was observed.
4. Application of EDAGUM®SM on potato breed Udacha promoted a 35 mg/kg decrease of nitrates. In respect to nitrate content production obtained from experimental treatments meets the requirements placed on dietary potato.
5. At the treatments with application of EDAGUM®SM on potato breeds Zhukovsky early and Udacha the yield of nutrients per hectare significantly increased as a result of increase of potato productivity, marketability and quality parameters: dry matter increased by 10.5-24.6 ts/hectares; starch by 6.7-11.9 ts/hectares; and vitamin C by 6.3-9.5 kg/hectare

In 2008-2010, in the Kursk State Agricultural Academy named Professor I. I. Ivanov,
Edagum SM humic fertilizer was tested on the mid-ripening potato variety Lena (vegetation period 90 days) according to the following scheme:

1. Control (tubers warming up for 2 weeks under variable temperature and light conditions);
2. MPT (methods of preparation of tubers): stimulating incision + germination + water (treatment of tubers)
   4 weeks before planting + foliar top dressing with water according to the growing season phases;
3. MPT + EDAGUM®SM treatment of tubers 4 weeks before planting;
4. MPT + EDAGUM®SM foliar top dressing three times in phases;
5. MPT + EDAGUM®SM Complex (Option 3 + Option 4).

Treatments were carried out through a knapsack sprayer with the following application standards:

- treatment of tubers 3 l EDAGUM®SM + 200 l of water per 3 t of tubers per 1 ha;
- non-root top dressing according to the vegetation phases (full shoots, budding - flowering, maturation) 1.5 l EDAGUM®SM + 300 l of water (for a single treatment)

Table 1. Influence of EDAGUM®SM on the yield properties of Lena potatoes

#	Treatment	Average for 3 years t / ha	Increase	
			t / ha	%
1	Control	16.8	-	-
2	MPT + water	19.3	2.5	14.8
3	MPT + EDAGUM®SM (tubers)	23.9	7.1	42.3
4	MPT + EDAGUM®SM (leaves)	27.2	10.4	61,9
5	MPT + EDAGUM®SM (complex)	31.4	14.6	86,9

An average of three years of research:

1. Processing of potato tubers provided an accelerated emergence of seedlings for 8 days. The introduction of non-root top dressing into the agricultural complex caused an even greater reduction in the growing season by 10 days, and the complex use of EDAGUM®SM (tuberization and non-root top dressing) - for another 3 days.
2. The weight of tubers under the bush increased to an average of 737-787 g against 420 g in the control.
3. The number of tubers has increased in the tuber nest up to 11 vs. 9 in the control, with a decrease in the number of small tubers from 3 (control) to 1.
4. The starch content increased by 0.4-0.7%.
5. The content of vitamin C in potato tubers increased by 3-9 mg/%.
6. The nitrate content in tubers decreased by 7-10 mg / kg
7. The yield increased by 14.6 t / ha or 86.9% compared to the control (16.8 t / ha) and by 12.1 t / ha or 62.7% due to EDAGUM®SM alone.

The best results were obtained with the combined use of EDAGUM®SM (treatment of tubers + 3 foliar top dressing).

In 2010 the **State Design and Technology Institute of Soil Fertility (UKRAINE)** conducted production tests of the EDAGUM®SM fertilizer on the Veneta and Darina potato varieties according to the schedule: treatment of tubers (120 ml/1 ton of seeds) + 2 treatments with EDAGUM®SM after the vegetation (400 ml/ha). The increase was 30.7 ql/ha and 22.9 ql/ha or 19% and 16% respectively, compared to the control.

In 2012 the **INSTITUTE OF SCIENTIFIC AND INDUSTRIAL RESEARCH (INDIA, SHRIRAM)** conducted research on the EDAGUM®SM application to potatos and eggplants. The experimental design: treatment of tubers (100 ml/30l of water) + 2 treatments after the vegetation (400 ml/ha). The yield increase of potatoes amounted to 1,739 kg or 18.7%, compared to the control. The yield increase of eggplants treated with EDAGUM®SM (treatment of seeds + 2 treatments after the vegetation) amounted to 21.99%.

TOMATOES

Uzbek Research Institute of Vegetable-cucurbits Crops and Potato investigated influence of fertilizer EDAGUM®SM on tomatoes breed Volgograd 5/95 (Samarkand area, Republic Uzbekistan).

Experimental:

1. Control without processing;
2. Soaking of seeds + double spraying with sodium humate manufactured from brown coal (800 g/hectare);

3. Soaking of seeds in EDAGUM®SM (0.005% solution during 10 h) + triple spraying with EDAGUM®SM (450 ml/hectare) in phase of 3-4 real leaves, 12-15 days after the first treatment and 12-15 days after the second treatment.

Influence of fertilizer EDAGUM®SM on biometrical parameters of tomato plants, breed Volgogradskiy 5/95

#	Treatment	Parameters			
		Height of themain stalk, cm	Amount of side stalks, ps	Amount of fruits, ps	
1	Control	58	8	16	
2	Sodiumhumate	61	16	20	
3	EDAGUM®SM	**70**	**13**	**25**	

Influence of fertilizer EDAGUM®SM on tomato yield, breed Volgogradskiy 5/95**:**

#	Treatment	Additional yield					
		to control		to sodium humate			
		т/га	**%**	**т/га**	**%**		
1	Control	-	-	-	-		
2	Sodiumhumate	11,0	28,9	**-**	**-**		
3	EDAGUM®SM	**13,0**	**34,2**	**2,0**	**4**		

Results of studying of influence of preplant treatment and triple spraying of tomato plants with fertilizer EDAGUM®SM show its stimulating influence on tomatoes growth and development. A significant increase of high quality yield (up to 13 t/hectares) was obtained.

ONION

In 2007 farm Koryt'ko (Volgograd area) tested fertilizer EDAGUM®SM in field trial for bulb onion in annual culture (breed Chalcedony).

Onion was treated with fertilizer EDAGUM®SM (500 ml/hectares) in phase of 5th real leave (with no combination with other preparations), the second treatment was carried out 10 days after the 1st one together with fungicide Ridomil Gold (2.5 l/hectares); third treatment was 2 weeks after previous one together with fungicide Ridomil Gold (2.5 l/hectares).

It is established, that application of fertilizer EDAGUM®SM promoted increase of onion yield on 6.3 t/hectares (13% to control). Besides, a good compatibility of EDAGUM®SM with fungicide Ridomil Gold was observed.

Tests demonstrated economic feasibility using of fertilizer EDAGUM®SM for onion cultivation in annual culture

APPLE TREES

In 2007 Joint-Stock Company "Agriko AM" tested fertilizer EDAGUM®SM on apple-trees (breed Pamyat' Michurina, plantings of 1991) on the basis of Open Company "Medveditsa" of Volgograd area.

Single spraying of trees with fertilizer EDAGUM®SM (450 ml/hectares) in a period of flower-bud formation was performed

As a result of using EDAGUM®SM the yield of apples increased by 15 centner/hectare, or on 19% to control; quality of production improved: bigger well colored fruits (40-55 mm against 20-35 mm on control) were obtained; plants were less damaged by diseases (scab, bitter pit spots)

In 2008 Research Institute of Gardening n.a. I.V.Michurin studied the efficiency of application of liquid humic fertilizer EDAGUM®SM in field and small plot trials in apple-trees.

Field trials were carried out in Open Society "Dubovoe" (Tambov area) and Open Society "Agronom" (Lipetsk area). Breed of apple-tree Zhigulevskoe, garden of 1986 year of planting, and planting scheme 8x4 m were used in Open Society "Agronom". Open Society "Dubovoe" used garden of 1991 year of planting, parent stock 54-118, and planting scheme 6x4 m. Rate of working solution for foliar spray was 1000 l/hectare. EDAGUM®SM was used in mixtures with pesticides (1200 ml/hectare) to improve quality of fruits and increase apple-trees' resistance to diseases. Trees were treated in phases of a pink bud, 5-7 days after flowering, early fruit drop, in periods of bud set, and intensive growth. Conditions of the vegetative period of 2008 promoted wide development of scab, the main disease of apple-trees.

Results: Spraying of apple-trees (breed Zhigulevskoe) by fertilizer EDAGUM®SM decreased the development of scab on leaves at an average on 15%, and on fruits on 11% comparably to control treatments (without EDAGUM®SM). Application of fertilizer EDAGUM®SM promoted increase of yield on 11% and improvement of fruits quality on 8% to control.

Small plot trial was carried out in work-study unit "Komsomolets" (Tambov area) on apple-trees breeds Venjaminovsky and Stroevsky; garden of 2002 year of planting, parent stock 54-118, planting scheme 6x4 m; plants were sprayed by working solution of EDAGUM®SM in rates 5 l/tree. Trees were treated in phases of a pink bud, 5-7 days after flowering, early fruit drop, in periods of bud set, and intensive growth. Experimental design:

1. Control without treatment;
2. $N_{90}K_{90}$;
3. Treatment with EDAGUM®SM (12 ml per 10 l of water);
4. $N_{90}K_{90}$ + EDAGUM®SM (12 ml per 10 l of water);
5. $N_{90}K_{90}$ + EDAGUM®SM (12 ml per 10 l of water) + Aquarin 1%;
6. Double treatment with Aquarin 1%.

Results: application of EDAGUM®SM on apple-trees of breeds Venjaminovsky and Stroevsky promoted increase of yield on 5.1-7.2 centner/hectare due to lower fruit drop. Joint application of mineral fertilizers and EDAGUM®SM promoted an increase of yield on 29-30%.

BANANAS

In 2018-2019 Limzar Farmer co-operative society Ltd (Gujarat, India) tested fertilizer **EDAGUM®SM** on banana (Dwarf Cavendish).

Dose protocol:

- 2ml/ltr drenching at transplanting
- 2ml/ltr two spray after flowering followed by 15 days interval
- 2ml/ltr once a month spray on bunch of fruit.

Observed differences between control & treated plants:

Bunch Weight (Average)

- Control - 49 Kg
- Treated - 60 Kg

Number of fruits/hand

- Control - 18
- Treated - 27

Fruit size (Length):

- Control - 15 to 18 Cm
- Treated - 18 to 21 Cm

Fruit size (Girth):

- Control - 10 to 12 Cm
- Treated - 12 to 14 Cm

Fruit weight (Avg)

- Control - 90 Gm
- Treated - 105 Gm

Time taken for flowering

- Control - 342 Days
- Treated - 285 Days

Yield per Plant (Average of fingers not bunch)

- Control - 62 Kg/Plant
- Treated - 73 Kg/Plant

Pathological observations:

Sigatoka leaf-spot &streak, endoparasitic, nematodes, & fusarium wilt development suppress

Root rot fungi:

- Control - 28% plants got affected.
- Treated - 7% plant got affected.

Topling disease (Premature fruit dropping):

- Control - substantial
- Treated - Negligible

Rust thrips on finges:

- Control - visible
- Treated - Not visible

Viral attach of BBTV BSV:

- Control - 30% plants got affected
- Treated - 9% plants got affected

Post Harvest Observation:

Post harvest quality:

- Fruits from treated plants were better in quality, having thicker skin in more uniform in size as compared to fruits from control plants.
  Also fruits from treated plants were much sweeter and tasty and had more Sugar content. The chips & pulp made out of treat plant fruits were tastier in quality

Diseases:

- Treated fruits had shown better resistance to post harvest diseases as compared to control

Post harvest fungal attack:

- Control - 35% fruits got affected
- Treated - Negligible

Shelf life (Average):

- Control - 5 weeks
- Treated - 7 weeks

GRAPES

In 2008 Open Company "AGRO-INNOVATION" on the basis of North Caucasian Research Institute of Gardening and Viniculture and Research Institute of Agriculture of Abkhazia tested EDAGUM®SM on industrial vineyards of>. Triple spraying of Shiraz, Cabernet-fran, and Aligote grapes was carried out before flowering, 8-10 days after flowering and before beginning of fruits ripening.

Treatment of vineyards with EDAGUM®SM promoted increase of grape yield on 16-23% to control. After application of humic fertilizer content of sugar significantly increased on 2.2-2.5 g/100 cm3

which is an important reserve in high quality winemaking.

KIWI FRUIT

In 2008 Open Company "AGRO-INNOVATION", on the basis of North Caucasian Research Institute of Gardening and Viniculture and Research Institute of Agriculture of Abkhazia sprayed young kiwi plantings (5 years old) including both male and female plants (breeds Hayward, Bruno) before flowering, 8-10 days after flowering and before the beginning of fruits ripening.

It is established, that the yield from kiwi bushes treated with EDAGUM®SM increased on 8.8-12.5% to control.

Influence of fertilizer EDAGUM®SM on yield of kiwi breeds Bruno and Hayward:

#	Breed	Yield 1 c\ha		additional yield to control	
		control	EDAGUM®SM	c	%
1	Hayward	120	135,0	15,5	12,5
2	Bruno	130	141,5	11,5	8,8

PEACHES

In 2008 Open Company "AGRO-INNOVATION", on the basis of North Caucasian Research Institute of Gardening and Viniculture and Research Institute of Agriculture of Abkhazia treated>young peach trees (8 years old) with EDAGUM®SM by triple spraying. Treatment influenced market properties of production: fruits enlarged, appearance of fruits improved significantly

FODDER GRASSES

In 2008 Stavropol Scientific Research Institute of Animal Industries and Fodder Production conducted tests of fertilizer EDAGUM®SM for meadow grasses (natural pastures) and leguminous crops (alfalfa) in farm "Novomarevsky" of Stavropol Territory.

Plants were treated with EDAGUM®SM (450 ml/hectares) in phases of level sprouting – regrowth, 5-6 real leaves and shooting.

Use of EDAGUM®SM maintained the productivity of natural pastures and leguminous crops on 2.3 and 2.4 centners/hectare accordingly, mowing period reduced on 3-8 days.

Observations showed, that under the influence of EDAGUM®SM leaf weight increased, amount of stalks decreased, which means that quality of green forage considerably improved. Application of humic fertilizers promoted increase of productivity of forage crops with optimal contents of protein, fat, and minerals (calcium, phosphorus).

MICROBIOLOGICAL RESEARCH & PHYTOHORMONAL ACTIVITY

In 2013 **the Russian Research Institute of Agricultural Microbiology of the Russian Agricultural Academy (Saint-Petersburg)** conducted research on microbiological features of the EDAGUM®SM fertilizer with the phytohormonal activity assessment.

Ammonifiers, amylolytic, denitrifiers were taken into account.

Installed:

- The number of physiological groups of microorganisms in the EDAGUM®SM

Ammonifying -58·10^6 *CFU/ml

Amylolytic - 62·10^6 *CFU/ml

Denitrifying - 2·10^4 *CFU/ml

* – CFU - colony forming unit.

It is established that humic fertilizer EDAGUM®SM has a strong stimulating effect on the growing of roots with the cuttings of blackcurrant, African violet and chrysanthemum. The number of rooted cuttings increases from 50-67% in the control to 80-100% after the soaking in the EDAGUM®SM solution.

The seed treatment of the tomato variety "Sibirsky skorospely" /Siberian fast-growing (50% germination) with the EDAGUM®SM humic fertilizer increases the seed germination (by up to 30%) and significantly increases the root growth. The length of the root is higher compared to the control by 65 to 92%, the length of a planting- by 20%. After the soil treatment with EDAGUM®SM and the three-time leaves treatment of the “Mikron” variety of tomato, the length of plants increased by 28.8%, the number of leaves by 31.9%, the number of flowers - by 59.1%, the yield increase amounted to 75.3% .
The foliar application accelerates the bud growth of the "Chorny krasavets"/Black Beauty variety of marrow. Both the number of buds (by 1.9 times) and their size increased which leads to an earlier and larger yield.

USE OF EDAGUM®SM IN RESOURCE-SAVING TECHNOLOGIES

Scientists and specialists of the company have developed a resource-saving crop cultivation technology based on a complex treatment with humic fertilizer EDAGUM ® CM soil (1-2 l / ha), seeds (0.4-0.8 l per 1 ton) and vegetative plants (two treatments on 0,4 l / ha) together with traditional means of chemicalization.

Data of scientific research conducted in 2014-2016. in different regions of the world, indicate that the use of this technology has allowed to obtain an additional crop:

• soybean 815 kg / ha (21.5% to control), while saving mineral fertilizers by 20% and pesticides by 10% (Institute of Technology of Technology INTA, Argentina);

• Wheat 1290 kg / ha (39% to control), while saving mineral fertilizers by 30% and pesticides by 10% (DonGaU, Russia);

• cotton 320 kg / ha (12% to control), while saving mineral fertilizers by 20% and pesticides by 10% (Research Institute of Agriculture, Turkmenistan).

Based on the results of the conducted studies, it can be concluded that systemic, annual soil cultivation with humic fertilizer EDAGUM®SM will improve its physical properties and structure, restore fertility and ecological parameters.

EDAGUM®SM IN ORGANIC FARMING

Some scientific studies show that organic EDAGUM®SM technologies without the use of chemicals can produce even more yield than traditional agrochemical technologies:

In the field organic experiments of DonGAU (Russia, 2016), a wheat yield of 2320 kg/ha was obtained, which is 220 kg/ha or 10.5% higher than in the control (without fertilizers) and 30 kg/ha or 1.5% higher than in traditional agrochemical technology (NPK + pesticides).

In the field organic experiments of the National Institute of Agricultural Technology INTA (Argentina, 2014-2015), a soybean yield of 3946 kg/ha was obtained, which is 336 kg/ha or 9.3% higher than in the control (without fertilizers) and 148 kg/ha or 3.9% higher than in traditional agrochemical technology (NPK + pesticides). It is important that this result is achieved with the minimum application rates of EDAGUM®SM: on soil 0.4 l/ha + on seeds 0.8 ml/kg + 1 foliar treatment 0.4 l/ha, and harvesting was carried out by machine.

*****

In the Dominican Republic in 2021, farm production trials were conducted on rice and banana plants using the full organic EDAGUM®SM scheme, including pre-sowing soil treatment, seed and plant treatment. Chemical fertilizers and pesticides were not applied.

Field trials on rice yielded a yield increase of over 30% over control, testing the new full organic EDAGUM®SM scheme in which rice seeds were treated with an increased dose of 300 ml (+10 L of water) per 100 kg of seeds.

It is noteworthy that banana plants were planted in unsuitable soil for them and yielded a yield 20% higher than the control result. Treatment scheme: Soil treatment 30 days before planting seedlings at the rate of 3 L of EDAGUM®SM + 1000 L of water per 1 ha; Treatment of holes when planting seedlings:
50 ml of EDAGUM®SM + 10 liters of water per 1 hole; Foliar treatments: 4 treatments at the rate of 2 L of EDAGUM®SM + 1000 L of water per 1 ha.

EDAGUM®SM & ORGANIC FERTILIZERS OF ANIMAL ORIGIN

The studies conducted in 2015 by the **Soil Chemistry Chair of the Soil Sciences Faculty of the Lomonosov Moscow State University** about the effectiveness of EDAGUM®SM compared with traditional organic fertilizers of animal origin (cattle manure of 2-year curing time) applied to wheat, have showed that the effect of application of 1 L of EDAGUM®SM to 1 hectare of arable land and seed treatment (0.8 L of EDAGUM®SM per 1 ton of seed) before sowing is equivalent to the treatment of 9-10 tons of manure and gives a yield increase of 31.5%.

The results of both field and vegetation trials of the wheat variety "Moscow 39" according to the scheme - Background (NPK) + tillage with EDAGUM®SM (1000 ml/ha) + 2 weeks after the tillage the wheat was sowed with seeds being treated with EDAGUM®SM (80 ml/100 kg of seed) + treatment after the vegetation during the tillering stage and leaf-tube formation (400 ml/ha) - show that EDAGUM®SM accelerates emergence of seed and germination of wheat; stimulates the growth and development of plants in all stages of the growing season; increases **grain yield** (**by up to 12%**) of high quality and total plant biomass compared to the introduction of cattle manure of 2 t/ha.

THE IMPACT OF EDAGUM®SM ON THE SOIL

Scientists of the Russian Research Institute of Agricultural Microbiology of the Russian Agricultural Academy (Saint-Petersburg, 2013) assessed the effect of a single soil spill with the EDAGUM®SM humic fertilizer solution on its biological and agrochemical properties. The soil was treated with a solution in a concentration of 1.5 liters per 1000 liters of water, an experiment without plants.
Installed:

- Microbial activity increases – breathing increases by 28.8%, which accelerates the decomposition of organic nitrogen and phosphorus compounds and makes them available to plants.
- Plant nutrition is increased while root feeding with EDAGUM®SM and due to the product itself: the

number of mobile forms of nitrogen – 17.4%, as well as phosphorus and potassium by 22.0 and 10.5% respectively.

THANK YOU FOR YOUR ATTENTION!

EDAGUM SM RUS LLC
www.edagum-sm.ru
info@edagum-sm.ru